The Milroy Lectures

ON

THE EARTH IN RELATION TO THE PRESERVATION AND DESTRUCTION OF CONTAGIA.

Delivered at the Royal College of Physicians of London

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LECTURE II.[1]

Delivered on Feb. 28th, 1899.

ENTERIC FEVER.

MR. PRESIDENT AND GENTLEMEN,—Enteric fever has of late years much occupied the attention of epidemiologists and bacteriologists and our knowledge of its definite relationship to filth, milk, and water has undergone considerable increase. The laboratory experiments connected with enteric fever are of great interest and value, but it would be, to say the least, hazardous to build upon them any measures intended for practical sanitation. It must never be forgotten that the typhoid bacillus does not fulfil one of Koch's postulates. The disease produced by the inoculation of guinea-pigs with pure cultivation of typhoid bacillus has but a remote resemblance to the disease which we clinically know as enteric fever, a disease which seems limited to the human species. Sidney Martin[2] found that "none of the ordinary cultures of the typhoid bacillus obtainable in the laboratories will kill an animal[3] but that it may be rendered virulent by inoculation and transference through a succession of peritoneal cavities and also by injecting simultaneously the products of other micro-organisms, such as streptococcus or bacillus coli communis. It is noteworthy that the bacillus coli communis and Gaertner's bacillus when subjected to similar manipulations are as toxic to rabbits[4] as is the typhoid bacillus. It must be remembered that "pure cultivations" of the bacillus typhosus cannot be said to exist in nature. We recognise, and it may be taken as proven, that the main cause of the endemicity and epidemicity of enteric fever in this country is to be found in the fæces of the patient, and yet Martin tells us that while the bacillus is invariably found in the spleen and mesenteric glands and in intestinal lesions "it is found in some cases in the motions of typhoid fever and also in the urine."

Dr. J. R. Carver, working under Delépine at Manchester, found the typhoid bacillus twice in 20 samples of typhoid fæces and once in 16 samples of typhoid urine.[4] Martin working with sterilised soils has shown that in soils which are more or less "polluted" with organic matter the bacillus typhosus will continue to live and spread at ordinary temperatures, but that in virgin soils (both sandy and peaty) the pure cultivations of the bacillus die out from some unexplained cause. Martin gives one experiment[5] to show that in unsterilised soil containing much organic matter the bacillus may continue to live, but as yet there has been no evidence of spreading. John Robertson and Maitland Gibson[6] collected 30 samples of soil from areas which they considered likely to be infected. "In not one single instance was the bacillus typhosus found."

These gentlemen carried out experiments in a field (soil: eight inches of clayey loam on 10 inches of sand and clay on stiff yellow boulder clay); each experimental patch had the turf removed and nothing was allowed to grow upon it. The patches were 18 inches square. Three patches were inoculated with 200 cubic centimetres of a pure cultivation of the bacillus typhosus mixed with one and a half gallons of tap water; No. 1 on the surface, No. 2 nine inches deep, and No. 3 18 inches deep, the top soil being removed and replaced. This was done on May 30th, 1896, and on August 26th the bacillus typhosus was found three inches below the surface of each, and at nine inches below the surface of No. 2 and No. 3, and also at 18 inches below the surface of No. 3. On Oct. 20th there were practically the same results. On Nov. 27th the bacillus typhosus could not be found in either patch. Towards the end of August, 1896, three other patches (Nos. 4, 5, and 6) were inoculated in the same way and on Nov. 27th no bacillus typhosus could be found. These patches were three feet square. On Jan. 17th, 1897, patches Nos. 4, 5, and 6 received two gallons of very weak beef tea which was repeated at fortnightly intervals till June 3rd, 1897, when on examination the organism was easily found. No organism was found at this date in patches Nos. 1, 2, and 3, which had not been fed with bouillon. Practically the same result was obtained on July 11th. The persistence of the bacillus typhosus appears to depend on feeding it with fluid nourishment. A sewer leaking into the soil would do this or liquid filth in a privy. It was shown that the organism would grow three inches downwards or upwards from a depth of 18 inches. The slight downward growth might be due to mechanical conditions. The effect of sunlight does not penetrate far.

Laboratory experiments went to show that vegetation (grass) prevented the growth of the organism. This may go to explain "why typhoid fever is so much more prevalent in towns than in rural districts." Attempts to prove the aerial conveyance of the organism from liquid filth failed.

Further allusions by Dr. J. Robertson to these experiments were made later in the year,[7] in the course of which he said: "During the winter months organisms disappeared from the surface soil and from these experiments I was led to believe that the deeper layers acted as a sort of shelter during the winter months from which the organism sallied forth to the surface during the warmer months." He had not noticed any relation between typhoid fever and the rise and fall of the ground-water, but he thought it was most common in places where the ground-water is near the surface. The bacillus typhosus quickly dies out in grass-covered areas.

Let us now turn from these experiments which, after all, are very artificial to the practical experiences of sanitarians in the matter. It may be premised that Martin's experiments show that the bacillus typhosus will grow in any soil rich in organic matter and that although aerobic it can be cultivated as an anaerobe even in an atmosphere of carbonic acid,[8] and the bacillus seems to be definitely destroyed by sandy or peaty "virgin" soils. Robertson and Gibson cultivated the bacillus on a soil in which clay predominated. Sir Charles Cameron is of opinion that it flourishes in gravel. At Dublin on August 23rd, 1898, he said, speaking of enteric fever: "That there is a connexion between enteric fever and the soil is shown by the results of observations of the distribution of more than 4000 cases of the disease in Dublin. Where gravel forms the site of streets there is far more typhoid fever than in districts which rest upon the stiff boulder clay. This is clearly owing to the fact that the bacillus typhosus, which is aerobian—that is, requires oxygen—can get it more freely in the loose gravels than in the stiff clays. In the gravel, too, there is a much greater space for the development and movement of the bacilli."

Dr. Scurfield of Sunderland said that "the greater part of the county of Durham in which typhoid fever had been prevalent during the last few years was covered with stiff boulder clay, and in the urban district of Sunderland typhoid fever had been just as prevalent in the boulder clay as in the houses built on sand or gravel." Pettenkofer, the chemist of Munich, is the person who is mainly answerable for the theory that enteric fever is due to a soil organism which grows with maximum vigour when the level of the ground water falls.

Dr. Christopher Childs, in a valuable paper which appeared in THE LANCET,[9] has placed us in possession of important facts. Munich lies on a bed of gravel 1700 feet above sea-level. Between 1851 and 1896 the population has increased from 124,000 to 412,000, so that modern Munich is largely a new city. Up to 1865 Munich was a city of soakaway cesspools and filthy surface wells, and it was not till 1858 that the cesspool system began to be remedied and not till 1865 that the water-supply began to be improved. Pettenkofer's early investigations, Dr. Childs says, led him to the conviction "that in Munich there was not the slightest connexion between the drinking-water and the typhoid,[10] and this in spite of the fact that the water was shown on analysis to be organically polluted. The analyses and general investigations of the earlier date have been very imperfectly recorded, but there is evidence, says Dr. Childs, that the water was much worse in the earlier periods than latterly. Of Pettenkofer's personal investigations Dr. Childs says: "I have not succeeded in finding recorded details but they derive their weight from the high authority of Pettenkofer himself." The enteric death-rate, which (per

[1] Lecture I. was published in THE LANCET of Feb. 25th, 1899.

[2] Croonian Lectures, 1898.

[3] When therefore Sir Richard Thorne in commenting upon Martin's pure cultivations of bacillus typhosus in sterilised soil says that they yielded the bacillus "presumably in virulent phase" (Local Government Board Reports, 1897-98, p. 23.) his presumption is scarcely warranted by the facts.

[4] THE LANCET, August 20th, 1898.

[5] Local Government Report, 1897-98.

[6] Brit. Med. Jour., Jan. 8th, 1898.

[7] *Ibid.*, August 13th, 1898.

[8] Local Government Board Report, 1887.

[9] THE LANCET, Feb. 5th, 1898.

[10] This may have been due to the fact that the wells were all equally bad.

100,000) was 202·4 for the decade 1851–59, fell to 147·8 in 1860–69; to 116·7 in 1870–79. In 1880 it was 72; in 1881 it had fallen to 18 and has not risen since.

The water in Munich is derived from the mountains and when these are covered with snow the subsoil water falls. It is a most interesting fact to note that Pettenkofer's Munich typhoid fever was a disease of winter. The incidence of the Munich typhoid fever between the years 1851–67 was, according to Pettenkofer, in monthly averages as follows:—

February	36·8	April	23·1	September ...	16·1
January	33·5	November... ...	19·0	July	15·8
March	31·8	May	17·6	June	15·2
December	28·5	August...	16·7	October	15·0

The average English sanitarian reading this account of Munich with its soak-away cesspools and foul drinking-water would not need any new theories to account for the prevalence of typhoid fever. If we accept Pettenkofer's theory that the fever was due to organisms in the subsoil it is interesting to observe that the Munich fever, unlike typhoid fever in other places, reached its maximum in February and was most rife in the coldest weather when the surface of the ground must have been often frozen. During the winter months when the big houses were closed and the stoves were lighted the interior of the houses must have been filled with cesspool air. An organism permeating the soil might be expected to die out gradually. The sudden fall of the death-rate from 72 in 1880 to 18 in 1881 seems to imply that the organisms suddenly died over the whole area of the city. Munich is a city in which the general sanitary condition has undergone gradual amelioration. Sewers on modern lines were begun in 1878 and 800 private slaughter-houses were destroyed in the same year. There is now a highland water-supply and typhoid fever has gone. But it is needless to say that the subsoil water rises and falls precisely as it did half a century ago. The connexion of typhoid fever in Munich with organisms growing in the soil is to my mind not proven.

In 1896 there were 111 cases of enteric fever at Chichester, of which the majority occurred in July and August and of which only two died (one committing suicide while delirious). 76 houses were attacked in localities which had been repeatedly invaded in former years. Of these houses 39 had well water (quality doubtful) and 36 had company's water. In 62 of the cases the patients were males and in 49 they were females. There had been recent works of drainage and it was found that the percentage of incidence of fever on the whole of the undrained houses of the town was slightly in excess of that of the drained houses. There was no evidence that the disturbance of the soil in this ancient walled city for works of drainage had influenced the incidence of fever. Many of the houses attacked had old privies, &c., and the back yards were soaked with organic matter. Enteric fever, as usual, showed a preference for filthy surroundings. This outbreak has been spoken of as due to the growth of the bacillus typhosus in the soil round the houses attacked, but the evidence is certainly not conclusive and the fact that the women who mind the house suffered less than the men is rather opposed to such a theory. The epidemic, which departs somewhat from ordinary epidemics in the time of its maximum virulence and its very low mortality, remains unaccounted for. Chichester is built on a bed of gravel. (The facts as to this epidemic are culled from Dr. Bulstrode's report to the Local Government Board.) In 1898 76 houses in Chichester were again infected with enteric fever. Of these 58 were "drained" and 18 "not drained"; 44 consumed town water, while 32 had well water. Mr. Jones, the medical officer of health, points out that the percentage of incidence was markedly in excess in the "well water" houses and slightly in excess in the "undrained" houses.

Enteric fever has long been regarded as a filth disease and there is abundant evidence that filthy surroundings in some way or other predispose to it. Water-logged privies soil-sodden with the leakage of sewers, the air of cesspools and traps, proximity of water-closets to the kitchen, and other conditions of filth are all bad. While we agree as to the fact we may differ as to the explanation. Some would assert that the bacillus typhosus is actually growing and spreading in the filth, and indeed that is possible, but direct evidence of it is wanting. Some would even say that the soil being inoculated the specific organism may continue to grow and spread in it far away from the point of inoculation and so (by growth, not irruption) may poison the local water at a distance. Of this there is positively no evidence whatever. If for the sake of argument we allow that the bacillus typhosus may grow in the soil we have to ask how it emerges from the soil to do us harm? We are here confronted with contradictions. Robertson and Gibson showed that the bacillus disappeared in the winter to reappear in the summer, while at Munich the increase of enteric fever was a phenomenon of midwinter. In Budapest it is associated with a rising ground-water and at Munich with the opposite condition. In this country it is a disease of autumn and the period of floods, while others assert that it may be conveyed by dust which ought to produce a prevalence in March. The opinions held by sanitarians and bacteriologists on this question differ widely, but there seems to be a consensus of opinion that a water-logged soil rich in organic matter is the one in which the bacillus typhosus is most likely to flourish. If this should be true the official position that in sewage treatment filtration through earth is a *sine qua non* becomes untenable.

In the discussion which followed a paper which I had the honour to read before the Royal Medical and Chirurgical Society in November, 1897, on the Prevention of Enteric Fever, and which has been published in vol. lxxxi. of the Transactions of that society, many eminent sanitarians and bacteriologists made most valuable statements. Sir Richard Thorne said (p. 56): "I do not think nature made any provision for the disposal of specific excreta. Nature provides an easy means of dealing with the ordinary healthy excreta of healthy people living on the land, but dangers arising from specifically contaminated excreta are, I fear, much more difficult to be thus got rid of."[11]

The danger from flies is, in Director-General Jameson's opinion, a very real one in tropical countries. By their agency fæcal poisons are probably carried to the food or milk. Dr. Sims Woodhead said: "We stand in need of further information in respect of the continuance of the typhoid bacillus in soil. I agree ..... that the typhoid bacillus has a much greater chance of persistence in a water-logged soil containing a moderate amount of organic matter than in a dry, well-aerated soil, however large an amount of organic matter it may contain. In this, however, my actual experience is limited, though I hold a strong opinion on the subject." When we consider that the bacillus of typhoid fever may remain in the intestine for some time after recovery as well as in the urine and gall-bladder, and when we also remember what Metchnikoff pointed out in relation to cholera—viz., that the vibrio may be present in the intestine a long time before an attack of cholera occurs, it would seem that we can have typhoid bacilli under very similar conditions present in the intestine in practically healthy individuals, and that this bacillus may remain in the intestine a considerable time before the intestinal tract becomes so altered that the bacillus has a chance of doing its special work. Then it is that bad, though not actually infected water, may help the typhoid bacillus to do its work."

Dr. Corfield insisted on the importance of sewer air and cesspool air as factors in producing the endemicity of enteric fever. He instances Lyons as a city in which cholera has never spread but in which typhoid fever is endemic. Lyons is a city of cesspools.

Loesener, in a paper[12] on the Viability of Pathogenic Bacteria in Interred Corpses, states that he injected into the vessels and cavities of dead pigs a great quantity of pathogenic bacteria so that their number should exceed that of the saprophytes. In the first experiments the animals were not interred and under these conditions the viability of the bacilli of typhoid fever and cholera did not exceed four or five days. When the animals were treated in this way and buried in a porous soil the pathogenic bacteria manifested a maximum viability as follows: Typhoid fever (one instance only) 96 days, cholera 28 days, tubercle 95 days, bacillus pyocyaneus 33 days, pneumobacillus of Friedländer 28 days, micrococcus tetragonus 28 days, and tetanus 361 days (showed complete virulence after 234 days). The bacillus anthracis preserved its complete virulence during the whole year of the experiment and the bacillus of *rouget du porc* and septicæmia of mice 234 days. As for the typhoid bacillus it was possible to isolate it from the buried corpses *only once*. "I believe," he says "with Koch that the value of Pfeiffer's reaction of immunity is relative and that outside the human body it is not in our power to identify the typhoid bacillus."

Loesener's conclusion is that cemeteries are not harmful (even when graves made in a permeable soil are liable to inundation either temporarily or permanently) provided the graves be surrounded by a layer of earth sufficient to filter the liquids traversing them.[13]

[11] This opinion is not quite in harmony with Sidney Martin's repeated demonstrations that the bacillus typhosus is killed by virgin sand or peat, and the death of it in Robertson and Gibson's soil which had not been watered with beef tea and its extermination by growing grass.

[12] Arbeiten aus dem Kaiserlichen Gesundheitsamte, vol. xii., f. 11, p. 448.

[13] From Annales d'Hygiène Publique et de Médecine Légale, troisième série, tome xxxvii., Janvier, 1897.

The epidemic of enteric fever in Maidstone in 1897 is of great importance in relation to the influence of the earth on contagion and the Report to the Local Government Board by Mr. J. S. Davy, Dr. T. Thomson, and Mr. G. W. Willcocks has put us in possession of most of the essential facts.

The date of the attacks (the notifications were later) in the town and in the County Lunatic Asylum as given in Table I. of the report were as under:—

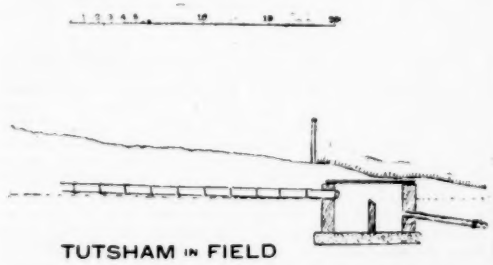
TABLE I.

Week ending.	Borough.	Asylum.
Sept. 4th, 1897	29	—
,, 11th ,, ...	165	1
,, 18th ,, ...	434	18
,, 25th ,, ...	432	48
Oct. 2nd ,, ...	274	12
,, 9th ,, ...	134	15
,, 16th ,, ...	64	4
,, 23rd ,, ...	45	2
,, 30th ,, ...	33	4
Nov. 6th ,, ...	25	2
,, 13th ,, ...	23	1
,, 20th ,, ...	19	—
,, 27th ,, ...	13	—
Dec. 4th ,, ...	4	—
,, 11th ,, ...	5	—
,, 18th ,, ...	3	—
,, 25th ,, ...	2	—
Jan. 1st, 1898	3	—

It was conclusively shown that the outbreak was due to the pollution of a spring or springs belonging to the Farleigh water-system. Of persons drinking this water nearly 8 per cent. were attacked, while of those drinking water belonging to other systems of supply less than 1 per cent. were attacked. The Farleigh springs, which are 15 or 16 in number, crop out on both banks of the Medway (mainly on the left bank) where the overlying and permeable green sand (locally known as "ragstone") rests upon the impermeable clay beneath. The water of these springs is for the most part pumped to the Barming reservoir, whence it is distributed mainly to the higher parts of the town. The Farleigh springs yield collectively over 3,000,000 gallons a week and they were treated collectively and their waters were all mixed in one reservoir, holding 500,000 gallons, before distribution. That this reservoir and the pipes connected with it became polluted with enteric poison was beyond doubt but it was not quite so clear which of the contributing springs was at fault. When, however, the springs were examined on Sept. 19th one and one only was found to be dirty—viz., the spring known as "Tutsham-in-Field." In order to condemn this spring, which yielded only 35,000 gallons per week, both chemical and bacteriological analyses were wholly superfluous and accordingly it was cut off from the supply on the following morning, Sept. 20th. This spring was reported as still dirty a month later and when I saw it on Nov. 5th it was still turbid and manifestly unfit for drinking purposes.

"Ragstone" is often fissured and there had been experiences in the Borough of Maidstone of the pollution of an old municipal supply known as "the Conduit," and of a well known as "Hill's Well" by leakage of sewage from broken pipes and similar well-understood causes. Bacteriological investigations were made by Dr. Washbourn and Dr. Durham on behalf of the corporation, by Dr. Sims Woodhead and Dr. Cartwright Wood on behalf of the water company, and by Dr. Tew and Mr. Foulerton on behalf of the rural authority. [The first four

FIG. 1.



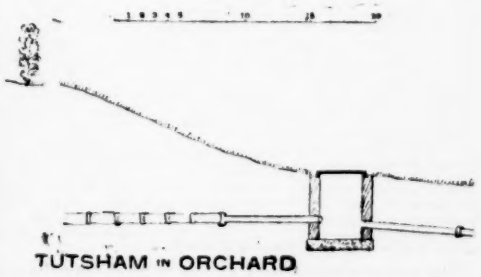
were all agreed that Tutsham-in-Field "water afforded evidence" of animal pollution on Sept. 19th and 20th, and the last two found similar evidence in the mixed Farleigh waters taken at Barming on Sept. 22nd. It is noteworthy and of very great importance that diligent search was made for the bacillus typhosus by the six eminent bacteriologists engaged but without success. The situation of the Farleigh springs was such as to render them liable to pollution, and on chemical grounds they were open to suspicion, but only one of them (Tutsham-in-Field) was really convicted of animal contamination and was obviously dirty and unfit to drink. The facts of the epidemic are, I think, quite consistent with the theory that it was caused by pollution of the spring at Tutsham-in-Field.

The Tutsham-in-Field spring derived its immediate supply from the undertraining of a hop garden and a reference to the diagram will show that its natural flow was assisted by some 20 feet of earthenware pipes with open joints which lay immediately on the Atherfield clay and at a depth below the surface which varied from two feet near the catch-pit to four feet at the end which was farthest in the hop garden (see Fig. 1). Immediately above the spot where the open pipes are nearest to the surface was a fence made of stakes driven into the ground which may have served as direct conducting channels down to the open-jointed pipes. (Parenthetically, I would remark that the danger of a dead fence in such a connexion is much greater than a hedge with living roots.) Close to this fence were deposits of fæces. The line of the spring occupies a slight depression in the ground and the natural surface drainage must have been to a spot very close to that at which the collecting pipes were shallowest. This spot was only a few yards from a path which crosses the hop garden fence by means of a stile and in short the circumstances were such that the risk of befoulment of the ground close to the collection pipes was very great [14] (see Fig. 2).

FIG. 2.

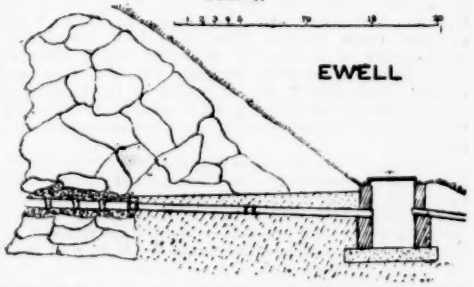
If the diagrams of Tutsham-in-Field be compared with those of Tutsham-in-Orchard and Ewell (Figs. 3 and 4) it will be observed that

FIG. 3.



earthenware pipes with open joints are used in all of them, but while in the first-named these open joints came to within two feet of the surface they did not come nearer than five feet at Tutsham-in-Orchard and 14 feet at Ewell. The surface of the ground above the pipes was formed of turf at Tutsham-in-Orchard and Ewell. The Tutsham-in-

FIG. 4.



Orchard spring was bright and apparently wholesome and the Ewell spring appeared to be the purest water of the whole of the Farleigh group.

It must be remembered that the three feet of hop ground which covered the open jointed pipes at Tutsham-in-Field was of a sticky, clayey nature liable to crack and fissure in times of drought and there can be little doubt but that the rain which washed this spot ran with its washings almost direct to the reservoirs. Under the circumstances which existed it is very important to study the rainfall and the exact times of its incidence. It is obvious that without rain no infective material could be washed into the "spring," and it is also obvious that a

[14] In his report to the Local Government Board Mr. P. Adams speaks of this fence as a "hedge," but both the photograph and the plan show that it was a "fence." The point is not unimportant when the tendency of fences to rot at the foot is considered.

short sharp shower might do infinite mischief at Tutsham-in-Field and yet be insufficient to affect the level of the subsoil water in Maidstone. Let us look at the facts of the epidemic from this point of view.

The incubative period of enteric fever is stated by the Clinical Society of London to vary between five and 23 days. I am justified, therefore, in assuming that the majority of those who might receive a dose of poison to-day would be attacked between the seventh and twenty-first day following. Between June 28th and August 7th there had fallen only 0·21 inches of rain. At the end of a dry period the delay in the distribution of water would not be great, but it is obvious that a house cistern might be charged with infective material and considerable delay might occur before the attacks, if the bulk of the household were away. After 40 days of drought rain fell to the extent of 0·44 inch on August 7th and 8th, and 0·13 inch fell on August 15th. On August 17th and 18th there was a fall of 0·53 inch, and if this rain washed infective material to the reservoir it should cause attacks between August 24th and Sept. 9th. The first attack of the epidemic is stated to have occurred on August 28th and between that and Sept. 8th there were 101 attacks. On August 26th hop-picking commenced and the population round the Tutsham spring was necessarily increased. On that day there fell 0·35 inch of rain, the heaviest fall in any one day since May 30th. The effect of this shower should become manifest between Sept. 2nd and Sept. 16th. The attacks down to August 8th have been previously given, but between the 8th and 16th there were 395 attacks. On Sept. 1st there was 0·31 inch of rain, again on Sept. 5th in the very middle of the hop-picking there fell 0·44 inch the heaviest fall since March 2nd. The effect of this should become manifest between Sept. 12th and 26th. Omitting the cases down to and including the 16th we find that between the 17th and 26th inclusive there were 625 attacks. There was 0·27 inch on Sep. 8th, hop-picking being still in progress. This would carry us on to Sept. 27th, 28th, and 29th, in which days there were 122 cases. On Sept. 18th and 19th (hop-picking having come to an end on the 13th) there fell 0·51 inch. This would take us down to Oct. 9th and we find that from Sept. 30th to Oct. 9th there were 237 attacks. On Sept. 20th the Tutsham springs were cut off, the effect of which would not be fully manifest for three weeks. On Oct. 12th the daily attacks suddenly dropped from 18 to seven.

It must be borne in mind that the Tutsham spring had presumably sent a considerable dose of muddy water to the Barming reservoir on Sept. 18th and 19th, the very day before it was cut off, when there fell 0·51 inch of rain, and the influence of this would be felt up to Oct. 11th at least. On Oct. 11th and 12th the daily attacks fell from 18 to seven and never rose again above nine. We must remember that after the Tutsham springs had been cut off there was the possibility of poison lurking in the foul Barming reservoir, the water pipes, and the house cisterns. On Sept. 29th there fell 0·83 inch of rain, a shower of tropical severity, and it is exceedingly likely that in the stirring up of the town sewers there may have been some leakage into the water service. There is no evidence on the point, but such things do happen at such times. In any case the effect of the wholesale poisoning of part of the water system which had taken place would be likely to endure for some time. It was not till Oct. 18th that the implicated water system was in great part (but not wholly) disinfected and this process was not completed entirely until Nov. 4th. The full benefit of this would show itself three weeks later (Nov. 25th). In the weekly returns of attacks (see Table L) there were only four for the week ending Dec. 4th, as against 13 for the week ending Nov. 27th. Subsequent to Nov. 27th there were only 17 attacks.

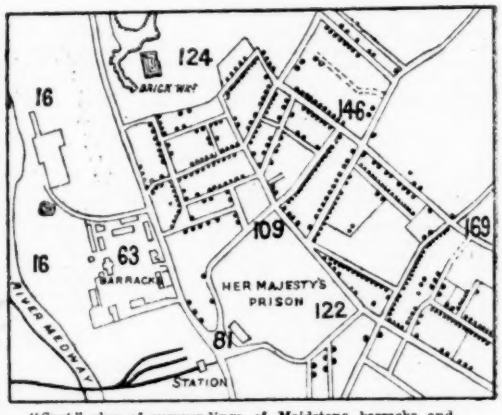
The epidemiological facts of this outbreak are quite compatible with the theory that the dirty water supplied from Tutsham-in-Field was the main cause of the outbreak, and I do not think that the effects of the contamination could be expected to finally disappear until three weeks after the completion of the disinfection of the water service on Nov. 4th. The inspectors in their report fix Oct. 18th as the day when the influence of the Farleigh water ceased to be felt in Maidstone and they say (p. 32): "Nearly all the cases notified after Oct. 18th (some 280 in number) are to be regarded as having had a cause other than the consumption of Farleigh water." This opinion seems to imply that in the estimation of the inspectors the disinfection of the Farleigh water system which began on Oct. 16th and continued until Nov. 4th was superfluous and useless.

Speaking of the 280 cases they continue: "By Mr. M. A. Adams they were referred to direct infection from previous cases and to unsanitary conditions of water-closets, drains, and sewers. This explanation appears to us to be the probable one if the unsanitary conditions referred to be taken in the wide sense of including the fouling of the soil by leakage from these defective drains and sewers. Recent researches into the life-history of the bacillus of typhoid fever go to show that this organism finds in a soil contaminated with foul matters from leaky sewers, drains, and cesspools conditions especially favourable to its vitality and multiplication. *That the soil on which Maidstone stands is thus contaminated was set beyond doubt by the evidence put before us.* To the existence of these conditions is mainly, we consider, to be attributed the remarkable persistence of fever in Maidstone after the primary cause of the outbreak had been removed by cutting off the Farleigh water-supply."

Do the facts of the case really establish the conclusion which the inspectors say is "set beyond doubt"? I do not find a single word in the report or a single experiment to prove that the bacillus typhosus was growing in the soil of Maidstone. The epidemic is remarkable not only for its severity but from the fact that six gentlemen, all eminent for their skill in bacteriology, failed to discover a single typhoid bacillus. The bacteriological investigations were upon a scale which was quite unprecedented and in so far as the bacillus typhosus was concerned were entirely and absolutely negative. It may be, as the inspectors hint was the case, that the bacillus typhosus was permeating the soil of Maidstone in November, December, and January very much as a blue mould permeates a cheese, but no examination of the soil is recorded in the report. There are facts, however, which make strongly against any such contention. These were the total escape of the barracks and prison.

On page 26 of the report is the following paragraph: "The barracks and the Maidstone prison are both within the borough and both are connected with the town sewers. The population of the barracks was 300, this total including 166 men, 44 women, and 88 children. The water supplied to the barracks is that of the Boarley system of the water company's supply. No case of typhoid fever occurred in the barracks during the year. At the prison the average population throughout the year was 171, the total number of prisoners received being 1925. The water used on week days is from a well 34 feet deep sunk in the Hythe beds of the lower greensand. On Sundays water is turned on to the prison from the Boarley mains. There have been no cases of typhoid fever or diarrhœa among the prisoners or staff during the whole of 1897." During the five months (August to December) there were probably 800 persons who drank water from the 34-feet well sunk in the "contaminated" soil of Maidstone. A reference to the map (Fig. 5) will show that

FIG. 5.



"Spot" plan of surroundings of Maidstone barracks and prison. The big numerals show the height above sea-level. The black dots are fever-stricken houses.

the area of the prison is closely hemmed in on the north and east by fever-stricken houses and the escape of the prison and barrack populations is most remarkable. Neither rise nor fall of subsoil water brought typhoid fever or diarrhœa to the prison.

The investigations connected with the Maidstone epidemic are of great interest as pointing to the wonderful protection which the humus affords to the underlying water against pollution from above. The whole of the Farleigh springs were of the same character, the catch-pits of many of them were liable to invasion in time of flood, and the gathering ground of most of them was highly cultivated and manured land. And yet none of them (always excepting Tutsham-in-Field) afforded evidence of serious bacterial impurities. It may be added that in the third quarter of 1898 there was one death from enteric fever in Maidstone and another death from the same cause in the fourth quarter, so that the "contaminated" soil of Maidstone was not able to contaminate the inhabitants during the drought of July, August, and September or the rains of October, November, and December of last year.

IMMUNITY.

Bacteriologists have abundantly proved that the germs of disease are ubiquitous. They are found in earth, air, water;

in the dust and on the walls of our dwellings, in clothing, in meat, milk, bread, and even occasionally, as Andrewes has shown, in hot baked rice-pudding. With regard to most of the necessities of life we hear the cry of "unclean," "unclean," until the wonder is that we are any of us left alive to warn our neighbours. The fact that many of us manage to live to a respectable age and to die from something which is non-infective cannot but make us consider whether after all the immunity of the individual is not the fact which tends more than any other to the improvement of the public health. It is wholesome for us to remember that the greatest sanitary achievement of our time has been the practical disappearance of typhus fever. Of the *causa causans* of this disease we know nothing. Its absolute disappearance has not been produced by successful germ hunting. Its disappearance is probably due to the improved conditions under which the masses of the population live as regards food and cleanliness. Few of us doubt that if this country should become involved in war and food should become dear and scarce in consequence the relative immunity of the population would be lessened and typhus fever would re-assert its sway. Whether we succumb to an infective disease or not probably depends in great measure to the dose of the poison which we receive. When an endemic disease such as enteric fever becomes epidemic it is due to the sudden dissemination of a poison in relatively large or virulent doses. Even in the most severe epidemics it is rare for more than 10 per cent. of those who have run obvious risks of receiving the poison to be attacked. The questions of virulence and vulnerability are most important. It seems to be well-established that the virulence of some of the pathogenic microbes varies immensely with the conditions of soil, temperature, air, sunlight, &c., under which they are grown, and it is a fact that must be remembered that it is not always the pure cultivation which manifests most virulence. Many infective diseases assume a virulence in the tropics which is rarely met with in temperate countries. This appears to be true of tropical malaria, enteric fever, cholera, yellow fever, anthrax, and tetanus. In hot countries where a temperature equal to the optimum for the growth of many pathogenic microbes is often continuously maintained for weeks in succession, the risks of contagion and the danger of uncleanliness must often have become apparent in a manner more convincing than is the case among us. The repeated injunctions as to uncleanliness in the Mosaic law and the rigid rules laid down as to the conditions which made a man unclean and which necessitated his subsequent purification must have been the outcome of experience. To eat with unwashed hands in a tropical country and without knives and forks would clearly be to run considerable risks. The regulations in force among the Hindus were even more stringent, and although some of the regulations may appear to us to be extravagant and nonsensical it is impossible not to admit that most of them have for their aim the protection of the individual and his fellow man from the risks of infection.[15]

There can be no doubt that the health and vigour of the individual is all-important in relation to infective disease. The enervating influence of a tropical climate upon Europeans is recognised as a potent predisposing cause of infective disease and if to the effects of climate be added those of inordinate fatigue and insufficient food the risks of infection getting a hold of the organism are greatly increased. Director-General Jameson told us last year in the debate on enteric fever already alluded to that "in almost all the posts occupied by European troops coöperating with the various columns in Afghanistan, extending from the British territory up to Kabul and Kandahar, cases of enteric fever appeared, some of which posts were occupied probably for the first time since the world began." In the Nile expedition in 1889 those troops suffered most which had undergone most exposure and fatigue "and it becomes difficult to resist evidence tending to show that in the causation of this disease there may be more factors than are generally acknowledged." Dr. Maclean, R.N. (in a letter to Sir J. Fayrer), alludes to the occurrence of enteric fever in the Island of Ascension, under circumstances of close observation where no connexion could be traced with defective sanitary arrangements, though it is probable that malarial influences did occur. "There is no such thing as a drain or a cesspool in the island, all the sewage and other filth being removed daily and thrown into the sea to leeward of all dwelling-houses. The water, partly collected from the roofs of buildings during rain and partly condensed, is stored in iron and cemented stone tanks and removed from all possible sources of contamination." It is of course possible that in a case such as this the bacillus typhosus may be lying dormant in the body ready to assert itself when bodily enfeeblement reaches a certain pitch. It has been asserted (and the assertion received the support of the late Professor Kanthack) that the bacillus typhosus may be found in an abscess years after the attack and the same thing holds good in a less degree with regard to the microbes of diphtheria and cholera.

Nothing is better established with regard to tubercle than its relation to overcrowding and unwholesome occupations. Three times as much tuberculous disease occurs in the centre of London as at the outskirts and an hotel servant in London runs a risk of dying from tubercle nearly 10 times as great as that of the farm labourer. In our combat with this disease we must by no means confine our efforts to microbe hunting. So again with "filth diseases," we must remember that almost all infective diseases are especially fatal to those who live in the midst of filthy surroundings. It is not, I think, at all necessary to assume, although it is possibly the case, that specific organisms are growing in the filth. In the cramped dwelling of the artisan where the privy is often barely six feet from the back door the risks of fæcal befoulment of the food or person are very great and when in such places large pails of fæces are left to putrefy for a week or more it is not to be wondered at that the inhabitants should show an undue predisposition to the infection of enteric fever, as has been pointed out by Boobbyer and others.

[15] In the Abbé Dubois's book on Hindu Manners, Customs, and Ceremonies, translated by Beauchamp (Clarendon Press, 1897), will be found a chapter (vol. i., p. 238), largely culled from the great book of Brahmin ritual called "Nittia-Karma," on hygienic rules and among them a section on "Rules to be observed by Brahmins when answering the Calls of Nature." 1. Taking in his hand a big *chembu* (brass vessel) he will proceed to the place set apart for this purpose which should be at least a bowshot from his domicile. 2. Arrived at the place he will begin by taking off his slippers which he deposits some distance away and will then choose a clean spot on level ground. 3. The places to be avoided for such a purpose are, the enclosure of a temple; the edge of a river, pond, or well; a public thoroughfare or a place frequented by the public; a light-coloured soil; a ploughed field; and any spot close to a banyan or any other sacred tree. 4. A Brahmin must not at the time wear a new or newly-washed cloth. 5. He will take care to hang his triple cord over his left ear and to cover his head with his loin cloth. 6. He will stoop down as low as possible. It would be a great offence to relieve oneself standing upright or only half stooping; it would be a still greater offence to do so sitting upon the branch of a tree or upon a wall. 7. While in this posture he should take care to avoid the great offence of looking at the sun or the moon, the stars, fire, a Brahmin, a temple, an image, or one of the sacred trees. 8. He will keep perfect silence. 9. He must chew nothing, having nothing in his mouth, and hold nothing on his head. 10. He must do what he has to do as quickly as possible, and rise immediately. 11. After rising he will commit a great offence if he looks behind his heels. 12. If he neglects none of these precautions his act will be a virtuous one, and not without merit; but if he neglects any of them the offence will not go without punishment. 13. He will wash his feet and hands on the very spot with the water contained in the *chembu* which he brought. Then taking the vessel in his right hand and holding his private parts in his left, he will go to the stream to purify himself from the great defilement which he has contracted. 14. Arrived at the edge of the river or pond where he purposes to wash himself he will first choose a suitable spot and will then provide himself with some earth to be used along with the water in cleansing himself. 15. He must be careful to provide himself with the proper kind of earth and must remember that there are several kinds which cannot be used without committing an offence under these circumstances. Such are the earth of white ant nests, potter's earth, road dust, bleaching earth, earth taken from under trees, from temple enclosures, from cemeteries, from cattle pastures, earth that is almost white like ashes, earth thrown up from rat-holes and such like. 16. Provided with the proper kind of earth he will approach the water but will not go into it. He will take some in his *chembu*. He will then go a little distance away and wash his feet and hands again. If he has not a brass vessel he will dig a little hole in the ground with his hands near the river side and will fill it with water which he will use in the same way, taking great care that this water shall not leak back into the river. 17. Taking a handful of earth in his left hand he will pour water upon it and rub it well on the dirty part of his body. He will repeat the operation, using only half the amount of earth, and so on three times more, the amount of earth being lessened each time. 18. After cleansing himself he will wash each of his hands five times with earth and water, beginning with the left hand. 19. He will wash his private parts once with water and potter's earth mixed. 20. The same performance for his two feet, repeated five times for each foot, beginning, under the penalty of eternal damnation, with the right foot. 21. Having thus scoured the different parts of his body with earth and water he will wash them a second time in water only. 22. After that he will wash his face and rinse his mouth out eight times. When he is doing this last act he must take very great care to spit out the water on his left side, for if by carelessness or otherwise he unfortunately spits it out on the other side he will assuredly go to hell. 23. He will think three times on Vishnu and will swallow a little water three times in doing so.

But it must be remembered that wherever putrefaction is going on and wherever anaerobic organisms are growing in a filth-sodden soil unwholesome gases, such as CO_2, H_2S, CH_4, and H, are being given off and it is impossible not to admit that the breathing of these gases, from week end to week end in the crowded courts of a great city may so lower the vitality of the body as to increase its vulnerability to infection of all kinds. But these gases which are naturally given off from sewers and sewer traps, from cesspools, from privies and from water-logged and filth-sodden soil are accompanied by "odours" which are often too subtle for the chemist to analyse but which, nevertheless, are sufficiently potent to make a strong man sick and faint and to reassert themselves in the excreta 24 hours after being inhaled. The odour given off by a tropical arum at Kew some few years since during the time it was in flower and just ripe for fertilisation was of a kind which could only be described as appalling and which made it impossible to enter the house where it was growing without putting a clip on the nose and holding the breath. I merely want to emphasise the fact that odours may have a power which neither the chemist nor the bacteriologist can gauge and that we must be ready to admit that to live in stinks and filth must depress the health and increase the susceptibility to infection by microbes some of which have perhaps a greater measure of ubiquity than we are definitely aware of.

Professor Stewart Stockman[16] reports an investigation which he carried out on a septic organism which proved fatal to 380 fowls out of 400 on a poultry farm. He says: "The most important thing about this bacillus seems to me to be its fatal effect on tuberculous birds while it appears to be non-pathogenic, or nearly so, for healthy birds. It is also interesting to note that it killed a rabbit affected with the coccidium oviforme although the healthy ones were little affected by it. This observation, I think, affords fresh evidence in favour of what is taught about certain other microbes—namely, that they are only pathogenic to the enfeebled organism."

DANGER OF WOUNDS.

It is an established fact and is now universally accepted that infective organisms may gain access to the body through the smallest conceivable wound whether of the skin or the mucous membrane. The various forms of septicæmia as well as erysipelas and malignant œdema are due to this cause. Tetanus, as we have seen, is always due to the inoculation of a wound and it is a question whether anthrax of cattle is not more often caused by inoculation of a skin abrasion than hitherto has been suspected. Whether any of our common infective fevers are communicable by accidental inoculation is a moot point and one which is certain to receive a full share of attention in the immediate future. It is certain that in the transmission of plague a broken skin bears a most important part, and it may be that other infections may be conveyed in the same way. A distinguished pathologist is credited with having infected himself with enteric fever by a post-mortem wound. The infections brought about by flies, ticks, and mosquitoes are at present attracting much attention from pathologists and it seems probable that the danger of certain "soils" and climates may be shown to be due in an increasing degree to the insects which find in the localities the various conditions necessary for their existence. It may be that in some instances an abrasion of the skin made by an insect may merely serve as a point of entrance for infective organisms abounding in the surface of the soil or in the immediate surroundings of the individual and having no necessary connexion with the insect itself. It seems certain, however, that in the majority of instances which have been worked out a particular species of insect serves as an intermediary host for a specific organism which affects a specific animal. We hear a good deal in a loose and speculative way about flies conveying fever. This may be true, but we must always bear in mind what I feel inclined to call the excessive specialism of nature. Insects which feed on dung and carrion are seldom attracted by the food of human beings and I confess to being somewhat sceptical as to the accidental conveyance of infection by "flies" which heedlessly buzz first into the fæces and then into the milk. The pathologist of the future will clearly have to call in the help of the entomologist.

[16] Veterinarian, September, 1898.

PRACTICAL CONSIDERATIONS.

The Maidstone epidemic has been very useful in directing attention to some of the common conditions which endanger water-supplies. Pasteur and all subsequent bacteriologists have directed attention to the value of the earth as a filter and it is a matter of common knowledge that a very shallow layer of compact earth will remove the bacteria and much of the organic matter from water percolating through it.

The greatest danger to shallow wells is to be found in subterranean collections of filthy fluids which leak through fissures in the earth and with a gradually increasing hydraulic pressure. If there be no such dangers in the immediate neighbourhood, then a properly constructed shallow well is safe. The lined well five feet deep which I have in the middle of my garden has given water of exceptional purity for years, notwithstanding that the ground is cultivated with human excreta to within six or seven feet of the well. Dr. Macmartin Cameron, medical officer of health for Kirkcudbright and Wigtown,[17] shares my opinion that a "surface well" properly constructed and in a selected situation is a safe source for water. Dr. Cameron's paper embodies much experience obtained in his official capacity and many of his observations are worthy of quotation as showing some of the limits of danger and safety in relation to shallow wells.

"*The construction of new village wells.*—When the wells of a village are shown to be contaminated and a new water-supply becomes imperative it is not, as a rule, necessary—not, at least, in the province of Galloway, for which I have the honour to be medical officer of health—to press on a gravitation scheme as the only way of meeting the difficulty. A simple and inexpensive well scheme will often suffice. All that is requisite is to sink new wells outside the precincts of the village on higher ground if practicable. Commonly enough the self-same water that feeds the old wells may be tapped at a point before it has entered the polluted ground of the village. All that is then required to secure perpetual immunity from pollution is to obtain possession of a sufficiency of ground around each well to be devoted for all time to purposes of filtration. With a sufficient reserve (anything, say, from half to one acre, according to circumstances) little or no danger will accrue from ordinary agricultural operations beyond, but it would be better that as much as possible of the outlying ground should be left under grass. There is no safer or better water than that which a surface well in an old grass park can be got to yield. This is an ideal site. I should have no fear even of a top dressing of manure, provided the ground in the immediate vincinity of the well were not profaned.

"Professor Hunter Stewart (Edinburgh) remarked that Dr. Vivian Poore's experiment with a six-feet well carefully cemented at the sides gave water which contained seven micro-organisms to the cubic centimetre and the bacillus coli was conspicuous by its absence. A part of the supply of the city (Edinburgh) was from wells near the Pentland Hills not more than eight feet deep, situated in highly manured land and exposed to pollution from neighbouring middens. From the water of these particular wells of a maximum of eight feet in depth he found a maximum of micro-organisms of 11 to the cubic centimetre and a minimum in three out of eight wells of absolute sterility. These observations abundantly supported the observations of Dr. Poore."

Reverting to the conditions which obtained at Maidstone I will mention a few considerations which, though obvious enough, are often neglected. During a drought such as occurred in June, July, and August, not only would the stiff hop land be liable to crack, but the earth-worms would retire to the lowest point in search of moisture. At such times they go deeper and deeper into the soil and lie coiled up in oval knots at the bottom of their burrows. I have upon the table a piece of a worm-burrow removed from my garden in September last at a depth of more than two feet. It is more than a quarter of an inch in diameter and would act as a drain from the surface to the deeper parts. This question of worm-burrows is one of great practical importance to sanitarians because, especially after a drought, they may serve to conduct surface water to considerable depths without its really being influenced by that biological filter the humus. Darwin[18] says that although worms generally live near the surface they may burrow to a considerable depth during long-continued dry weather and severe cold; the depth varies with the soil.

"In a bed of fine sand overlying the chalk which had never been disturbed a worm was cut into two at 55 inches and another was found here at Down in December at the bottom of its burrow at 61 inches beneath the surface. Lastly, in earth which had not been disturbed for many centuries a worm was met with at a depth of 66 inches and this was in the middle of August. The burrows are lined with viscid earth voided by the worm which gives at once smoothness and a certain amount of durability to the burrow."

Then, again, we must not forget the effect of harvest on the soil. Before harvest the amount of moisture retained upon the growing plant and absorbed by the still active

[17] Brit. Med. Jour., August 13th, 1898.
[18] Vegetable Mould and Earth-worms, p. 111, *et seq.*

root would prevent anything except the heaviest rain from penetrating, although even at such a time one must admit that even half a pint of water if thrown on a suitable place might travel *viâ* clay-crack and worm-burrow to a depth of five feet or more. When harvest begins not only is the earth deprived of its green protecting mantle but the upward drainage of the root action ceases and with the falling temperature of autumn and the lessened evaporation the rain which falls has an ever-increasing power of penetrating the soil. In a hop garden the first step in harvesting is the removal of the pole, and the hole thus left is capable of conducting rain water to a depth in the soil of two feet or more. If, therefore, there be open-jointed stoneware pipes in a hop garden at a depth of two or three feet from the surface it is possible (nay, likely) that when the hop-poles are removed a surface channel three or four inches in diameter may communicate with these pipes and a heavy rain may wash solid matters into them from the surface.

There are other practical matters which need consideration in relation to liability of springs to suffer from surface contaminations. If a plant or tree dies—be it hop, beech, hazel or what not—the roots, instead of helping the upward drainage of the soil and preventing surface water from reaching the springs may serve as a direct guiding channel from the surface to the spring. And if the spring be artificially maintained by under-draining it with open-jointed pipes (an operation which involves a considerable disturbance of the ground and its artificial re-making) this danger is considerably increased. Burrowing animals are necessarily a danger in this connexion and if rats or rabbits establish themselves anywhere near the outcrop of a spring they must be exterminated. Rats and rabbits sometimes burrow very deeply, but I have not been able to get any authentic statement as to the maximum depth in the soil to which they may penetrate. Rats are animals which the sanitarian is bound to regard with some suspicion. In relation to the plague they seem to be a very definite danger and when they crawl from the sewers (their favourite lurking place in towns) to our houses it is possible that they may be at least as dangerous as sewer gas. Rats occasionally make their homes in dung-heaps, especially if such heaps be made in outlying places and are long neglected. It is well known that they invade corn ricks in spite of elaborate precautions, but it is safe to regard the rat as a haunter of foul places and a lover of filth and its presence among us is often due to our permitting accumulations of filth and our delay in putting filth to its proper use.

Although it is probable that a very few inches of soil may, if properly tilled and cultivated, serve as an efficient protection to the subsoil water, we must nevertheless be mindful of the accidents which may serve to conduct filth from the surface to the springs. The danger of having a catch-pit flooded from the surface is one which can easily be guarded against by covering with suitable structures. The ground above the outcrop of a spring ought to be carefully turfed to a point which is six or seven feet above the level of the spring. A spring used as a water-supply must be very carefully watched. If the water become turbid or if a worm find an entrance to the catch-pit the use of such water should be discontinued or it must be boiled and filtered until the cause of the turbidity be satisfactorily demonstrated. Such springs should always be carefully inspected during heavy rains, because it is at such times especially that shallow springs establish surface relations.

The question arises whether it is safe to allow the gathering ground of a spring to be cultivated? This is a national question of the very greatest importance. No nation which is dependent upon its native soil for food production could possibly afford to raise such a question. What would a Chinese say if you told him that the water of his well contained a trace of ammonia and had a permanent hardness above the local standard and therefore his tea-gardens and rice-fields must remain unmanured and be converted to permanent pastures? His answer to the "foreign devil" who ventured to propound such a theory had better go unrecorded. But in China they boil the water before drinking it and they do not seek to fix the responsibility for the absolute purity of the water of a district upon a single underpaid individual; nor do they talk about "manslaughter" when a break-down in the arrangements from some cause, natural or artificial, brings about an outbreak of disease.

Provided there be a fairly thick layer of earth above the spring I am inclined to think that there is safety rather than danger in the cultivation of the overlying soil. Any spring which is covered by seven feet of soil—that is, six inches more than the depth of the deepest recorded earth-worm, might be considered safe from the risk of unchanged organic matter soaking into it from above.[19] In the first place, the cultivation of the land ensures that it is visited more or less frequently by individuals more or less intelligent. A gathering ground for water which is remote from the haunts of man has dangers of its own. Rats or rabbits may burrow in it and these as well as other animals and birds may provokingly die in the runnels which primarily collect the rain-water and I cannot understand how anybody who has ever walked over a moor can maintain the thesis that water running off a neglected waste is safer to drink than that which has percolated through well-cultivated land.

Last year I visited a spring which was being used for public purposes and which was and had been supplying water of excellent quality. The spring which rose in a little copse lying in a natural dell in a remote and seldom visited spot was enclosed and protected against surface washings which the configuration of the ground would certainly conduct towards it in times of flood. Some of the trees were dead and their stumps and roots were permeated with fungi and were rotten and one could not but regard it as possible that these rotten roots might serve as conducting channels from the surface to the water which was running beneath to the neighbouring town. Possibly the workings of rabbits or other burrowing beasts had hastened the death of some of the trees. If so, the burrows might run very close above the gathering water. Further, there was evidence to show that this dell was visited by an occasional tramp and had been made a playground by the children from the nearest group of cottages. It is clear that the non-cultivation of this particular spot was a source of danger rather than of safety to the purity of the spring.

Enteric fever is a disease especially liable to become epidemic in the autumn. The autumn is the time of year when after removal of the crops the parched earth is soaked and it is also the time of year when there are large accumulations of manurial matters waiting to be spread upon the land. In the summer the yield of springs is seldom increased no matter how heavy may be the rains. The water which falls upon the earth is all absorbed by the roots of growing plants and to a large extent mounts upwards in the plant to help metabolism and to quicken growth. With the ripening and harvesting of the crops root action ceases, water which falls upon the earth tends more and more to percolate, and when the early frosts have given their death-blow to the greenery of summer then the springs begin to rise and to yield more water. The nitrification and final solution of organic matter in the soil goes forward mainly, if not entirely, in the upper layer and it is doubtful if any appreciable amount of oxidation takes place in the parts which are beyond the reach of tillage. A certain proportion of the mineralised organic matter necessarily escapes absorption and percolates with the water and if there be much unused nitrates remaining in the soil after harvest the amount which percolates to the springs may be considerable. If nitrates be placed upon the soil in the form of artificial manures they are often dissolved and washed beyond the reach of plant roots with the first heavy shower. Not only nitrates but soluble salts of ammonia are placed on the ground in large quantities and the presence of free ammonia in the drainage water of cultivated land which has been *artificially* manured need not be an indication of pollution in the proper sense. It must be very hazardous to draw just conclusions as to the wholesomeness or otherwise of water from the amount of nitrates in it.

[19] For the same reason, although I agree with Dr. M. Cameron, I am of opinion that the first eight feet of all "shallow" wells should have an impermeable lining.

WESTON-SUPER-MARE HOSPITAL AND DISPENSARY.—The annual meeting of this institution was held on Feb. 20th under the presidency of Major Whitting. The report stated that 269 in-patients had been admitted, 542 out-patients treated, and 727 casualties attended. The members of the Provident Dispensary at the end of 1898 numbered 2279. The financial statement showed that the general receipts for the year amounted to £1909 and after meeting expenses a balance of £5 remained.

ABSTRACT OF

The Arris and Gale Lectures

ON

THE ANATOMY AND SURGERY OF THE PERITONEAL FOSSÆ.

Delivered before the Royal College of Surgeons of England on Feb. 27th and March 1st and 3rd, 1899,

BY B. G. A. MOYNIHAN, M.B., M.S. LOND., F.R.C.S. ENG.,

ASSISTANT SURGEON TO THE LEEDS GENERAL INFIRMARY.

LECTURE I.

Delivered on Feb. 27th, 1899.

THE DUODENAL FOSSÆ; DUODENAL HERNIA.

MR. PRESIDENT AND GENTLEMEN,—The subject which I have chosen for the lectures which by the grace of the Council of this College I am permitted to deliver is the Anatomy and Surgery of the Peritoneal Fossæ. In the first lecture I propose to consider the anatomy of the duodenal fossæ and the various forms of duodenal hernia. In the second I shall describe the pericæcal fossæ and discuss the reported cases of hernia occurring in the neighbourhood of the cæcum. In the third lecture the intersigmoid fossa and intersigmoid hernia and hernia into the foramen of Winslow will be discussed.

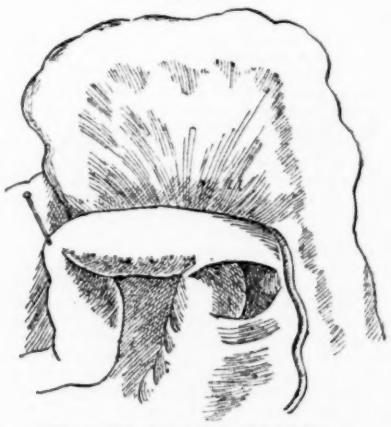
THE DUODENAL FOSSÆ.

In describing the anatomy of the various fossæ found in the duodenal region it is well to clear the ground a little by referring to the exuberant and redundant nomenclature which has been adopted by various writers at different periods. Most unfortunately the same name has been adopted to describe entirely different fossæ. The name "duodeno-jejunal" has been applied to at least three separate pouches. It is a matter of no little difficulty to choose an exactly appropriate name. I have given the most apt title first and the alternative names are mentioned in order to avoid misunderstanding. I have examined for the purposes of these lectures over 200 bodies; not consecutively, but when time and opportunity permitted. In all cases where a vestige of old peritonitis existed I have made no record. I have also examined the bodies of 34 fœtuses of all ages. The varying descriptions given by writers to the same fossa and its determining fold may be readily accounted for. The folds and fossæ vary in their appearance according to the age of the patient. In the fœtus and in children they are very distinctly and clearly seen. In the aged, owing to the deposit of fat, traction effects, and so forth, they may become considerably altered. The true typical forms are seen in the young and it is upon observation of young subjects that I have based my descriptions. I recognise the following fossæ as occurring in this neighbourhood:—(1) The superior duodenal fossa; (2) the inferior duodenal fossa; (3) the posterior duodenal fossa; (4) the duodeno-jejunal fossa; (5) the intermeso-colic fossa; (6) the infraduodenal fossa; (7) the paraduodenal fossa (the fossa of Landzert); (8) the mesenterico-parietal fossa (the fossa of Waldeyer); and (9) the para-jejunal fossa (the fossa of Brösike).

1. *The superior duodenal fossa* (recessus duodeno-mesocolicus superior) is present in from 40 per cent. to 50 per cent. of cases. (Fig. 1.) It may exist alone or with the inferior duodenal fossa. It lies to the left of the ascending portion of the duodenum. It is bounded in front by the superior duodenal fold, triangular in shape, presenting a lower free margin, slightly concave, the inner end of which is blended with the peritoneum on the duodenum and the outer margin of which is lost on the posterior parietal peritoneum.

2. *The inferior duodenal fossa* (fossa duodeno-jejunalis of Treitz; recessus duodeno-mesocolicus inferior of Brösike). (Fig. 1.)—This is the most frequent of all the peritoneal fossæ in this region, being present in from 70 to 75 per cent. of cases. It is placed on the left side of the ascending portion of the duodenum, opposite the third lumbar vertebra. The orifice looks upwards and is opposed to the mouth of the superior fossa. The fossa is bounded by the inferior duodenal fold, thin, sharp, and with a concave upper margin. The inferior mesenteric vein and the left colic artery are generally found well to the left side of the point of fusion of the fold with the parietal peritoneum. The fossa is liable to variation in size and extent. Treves has figured many of the aberrant forms. In general the first joint of the middle finger can be

FIG. 1.

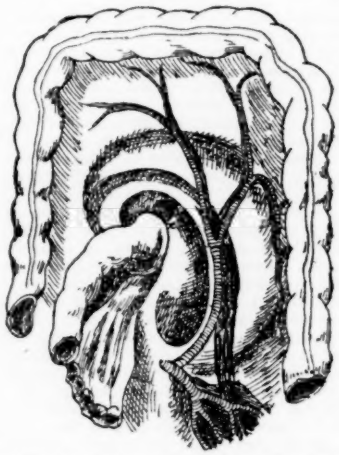


The superior and inferior duodenal fossæ.

easily passed into the fossa. The superior and inferior duodenal folds are not infrequently blended at the outer extremities, so that a single oval orifice leads to the two fossæ. The anterior fossa very commonly extends some little distance behind the ascending portion of the duodenum.

Genesis of the superior and inferior duodenal folds.—It is to Treitz (1857) that we are indebted for the first explanation given of the formation of the folds. He considered that they were traction folds due to the dragging of the intestine

FIG. 2.



The posterior duodenal fossa (*x*) and the paraduodenal fossa.

in the displacement of the cæcum and ascending colon to the right. Waldeyer believed that they were vascular folds raised up by the inferior mesenteric vein. According to Treves the inferior duodenal fold represents the remains of the mesoduodenum and is comparable to the duodenal fold of the hyena. None of these views are acceptable. As shown long ago by Toldt, the folds are fusion folds. They are caused by the process of "physiological adhesion" between the original left, afterwards anterior, surface of the ascending portion of the duodenum and the right or anterior

surface of the descending mesocolon, and date their origin from the time when these two peritoneal surfaces were in close apposition.

3. *The posterior duodenal fossa* (Fig. 2, *x*) (recessus duodeno-jejunalis posterior of Brösike; the fossa of Gruber).—This is a small fossa lying immediately behind the upper portion of the ascending limb of the duodenum. Its orifice is directed upwards and to the left and on its right side is the plica suspensoria, a fold raised up by the muscle of Treitz. It was described as an "accessory sac" by Gruber.

4. *The duodeno-jejunal fossa* (recessus duodeno-jejunalis superior).—On dragging the transverse colon upwards and the jejunum downwards and to the right there can be seen at the root of the transverse mesocolon a fossa which results from the plunging of the duodeno-jejunal flexure into the root of the transverse mesocolon. This fossa is the duodeno-jejunal; it exists in from 15 per cent. to 20 per cent. of the bodies examined. Its lateral boundaries are two folds, the duodeno-mesocolic, which are in reality the continuations backwards of the two layers of the mesentery. The fossa is bounded above by the pancreas, to the right by the aorta, and to the left by the kidney. In the floor lies the left renal vein. The duodeno-jejunal flexure is a hernial content of the sac.

5. *The intermesocolic fossa* (recessus intermesocolicus transversus).—This is probably a modification of the last fossa; it runs horizontally in the root of the transverse mesocolon. In all cases there is a marked deviation of the duodeno-jejunal flexure to the left.

6. *The intraduodenal fossa* (fossette retro-duodénale Jonnesco).—The orifice of this fossa looks downwards; its apex reaches the duodeno-jejunal angle, the muscle of Treitz, and the pancreas. It is bounded in front by the posterior aspects of the horizontal and ascending portions of the duodenum, behind by the aorta, and laterally by two folds, the duodeno-parietal.

7. *The paraduodenal fossa* (Fig. 2) (recessus venosus; fossa of Landzert).—The complications of this fossa are frequent. In its typical form it may be thus described. It is placed to the left and some distance from the ascending limb of the duodenum. The fossa is caused by the raising up of a fold, the plica venosa, by the inferior mesenteric vein, a fold which may be not inaptly described as a "mesentery" for that vein. Behind, the sac is bounded by the parietal peritoneum covering the psoas, the renal vessels, the ureter, and a portion of the left kindey. Below, it is limited by the mesenterico-mesocolic fold. The orifice of the sac is wide and it looks downwards and to the right. The plica venosa consists of a vertical and a horizontal portion, the vertical being to the left and below the fossa and the horizontal bounding the fossa above. The inferior duodenal fossa may be present with the paraduodenal. In that case there is always an amalgamation of the determining folds. Such a fossa was described by Treitz and was considered by him as the normal condition.

8 and 9. *The mesenterico-parietal fossa and the fossa parajejunalis.*—These may conveniently be studied together, for they are practically the same fossa under different conditions. The fossa is situated in the first part of the meso-jejunum, immediately behind the superior mesenteric artery and immediately below the duodenum. Waldeyer who is the only observer who has noticed a fossa in this position with the intestines normal has described it as existing only in the fœtus. I have, however, seen two well-marked examples in the adult. Brösike who describes a similar or more probably the same fossa asserts that it can only be found when the first portion of the jejunum is adherent to the posterior abdominal wall. As the fossa in any case lies immediately behind the first portion of the superior mesenteric artery the jejunal adhesion is probably merely an episode and in no causal relationship with the fossa. The peritoneum of the left leaf of the mesentery lines the pouch the opening of which is to the left and the fundus to the right. A forcible enlargement of the fossa results in the lifting up of the posterior parietal peritoneum in the right half of the abdomen.

DUODENAL HERNIA.

Duodenal hernia is of two kinds. In the first the hernial sac is situated on the left side of the abdomen and in the second to the right. In both cases there may be also an upward and a downward increase, but the essential difference between the two forms lies in the varying direction of their lateral deviation. In the later stages of each the sac may practically fill the abdominal cavity. I propose to apply the terms "left duodenal hernia" and "right duodenal hernia" to the two varieties, to emphasise the fact that there is an intrinsic difference not only in the mode of growth, but also and chiefly in the points of origin of the two forms.

Left duodenal hernia (Fig. 3).—This is the commoner variety; 57 cases are recorded. A perfectly typical case, for which I am indebted to Dr. T. Wardrop Griffith, is here depicted. Without discussing the matter closely it may be affirmed that only one of the fossæ above described is capable of developing into the sac of a hernia. That one is the paraduodenal fossa, or the fossa of Landzert. In all the cases recorded it has been found that in the anterior margin of the orifice of the sac lies the inferior mesenteric vein. With it for a shorter or longer distance there runs the ascending branch of the left colic artery. The anterior margin of the sac is formed, in fact, by the plica venosa. The plica venosa normally bounds the fossa of Landzert and it is in that fossa and in that fossa alone that a hernia can develop. A left duodenal hernia is characterised by three points: (1) the presence of the inferior mesenteric vein of the neck of the sac; (2) the hernia spreads either outwards towards the descending mesocolon or upwards towards the transverse mesocolon or both; and (3) the hernial sac consists of a single layer of peritoneum. Behind, the sac lies in contact with the posterior abdominal wall and in front of it there is the posterior parietal peritoneum. The orifice of the sac is situated at the back of the hernia in close approximation to the lumbar vertebræ. In a large hernia it is necessary in order to expose the neck of the sac to drag the whole tumour well over to the left side. The orifice is then seen close down to the third lumbar vertebræ. The average size of the opening is six centimetres long and four centimetres broad. The size of the hernia varies enormously. The smallest is recorded by Brösike. It occurred in a child 14 days old, and the length of intestine in the sac was between two and three centimetres. In several cases, including the first recorded by Neuebauer, the whole of the jejunum and ileum lay in the sac. As the hernia increases in size it reaches the descending colon on the outer side. In some cases the colon is pushed backwards and covered by the hernia; in other cases the hernia passes behind the colon which then lies in the anterior wall of the sac the hernial tumour appearing therefore on the outer side of the colon. The difference in the behaviour of the colon I believe to be due to the condition of its peritoneal surroundings. When no descending meso-colon is present the colon is pushed backwards by the hernial swelling; when a descending meso-colon is present it is used up, so to speak, as a covering for the sac, and the hernia passing behind the colon comes to lie on its outer side.

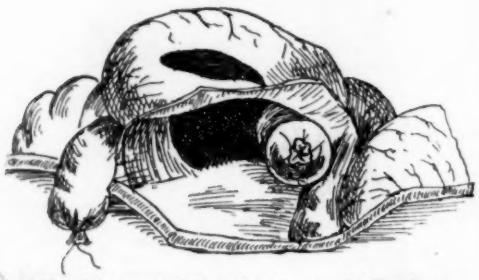
FIG. 3.

Left duodenal hernia. Mr. Shattock's specimen in St. Thomas's Hospital Museum.

Right duodenal hernia.—This is the rare variety. Only 13 cases, exclusive of the specimen shown, are recorded.

This specimen, for which I am indebted to Dr. T. Wardrop Griffith, has been preserved for some years in the post-mortem room of the Leeds Infirmary. The notes of the case have not been traced, but Dr. Griffith's recollection is that the death of the patient was unconnected with the hernia. The point of origin of this hernia has never been satisfactorily explained. Jonnesco gives an unintelligible description of the process by which a left duodenal hernia is supposed to turn over to the right. Brösike believes that in all specimens which are recorded there has been a jejunal adhesion to the posterior abdominal wall. The fossa of Waldeyer (mesenterico-parietal) has entirely escaped observation by other writers. I believe it to be in this fossa that a right duodenal hernia develops. On examining the orifices of the case recorded by Dr. Barrs and the specimen placed at my disposal by Dr. Griffith this opinion seems beyond disproof. The drawing of Dr. Barrs's case (Fig. 4) shows the

FIG. 4.



Orifice of the sac of a right duodenal hernia. Dr. Barrs's case.

orifice of the sac in precisely the spot occupied by the fossa of Waldeyer. Brösike figures a case observed by himself in which the jejunum was adherent posteriorly. In order to clear up this point as to jejunal adhesion I have carefully examined the reports of all the cases recorded. In seven of them we may take it that this adhesion was present; in the remaining seven it was certainly absent. We may therefore describe two forms of right duodenal hernia, the former as hernia mesenterico-parietalis parajejunalis and the latter as hernia mesenterico-parietalis paraduodenalis. In both varieties the anterior margin of the sac contains the superior mesenteric artery. It is interesting to note that in two recorded cases, Zwaardemaker's and Neumann's, there was a twisting of the bowel at the orifice of the sac amounting, it is said, to volvulus.

Diagnosis.—Duodenal hernia unless strangulated gives rise to practically no symptoms. In many cases the hernia has been found accidentally on post-mortem examination. When strangulation occurs in addition to the symptoms of acute intestinal obstruction a characteristic appearance of the abdomen has been noted. There is a tumour in the central part of the abdomen and around it a flattened area.

The tumour has the following attributes. 1. It is limited to a definite region of the abdomen. In left duodenal hernia it lies at first to the left and upper, in right duodenal to the right and lower, parts of the abdomen, but in each case spreads eventually over almost the whole abdominal cavity. Around the tumour is an area of depression corresponding to the position of the colon. In size the tumour may vary. It has been described as being of the size "of a child's head." In Dr. Barrs's case it was "equal to a nine months' pregnancy." It is slightly moveable but is fixed during respiration. 2. The tumour is marked out distinctly by palpation. On percussion it is always resonant. The degree of resonance varies in different cases and in different parts of the same tumour. But the striking feature is that the tumour is a palpable, definite, resonant mass. In the centre of the tumour or over its whole mass may be seen coils of intestine. The tumour may bear a very obvious relation to the clinical condition of the patient, becoming more tense and prominent and very much more tender when the symptoms undergo exacerbation. As the symptoms decline the tumour becomes less aggressive. 3. On auscultation distinct gurgling sounds may be heard anywhere in the tumour.

It is important to remember that owing to the position of the inferior mesenteric vein in the neck of a left duodenal sac the radicles of this vein may become enlarged, as in the case of the hæmorrhoidal veins, or venous trunks on the anterior abdominal wall may be so increased in size as to form a striking feature of the case.

LECTURE II.

Delivered on March 1st, 1899.

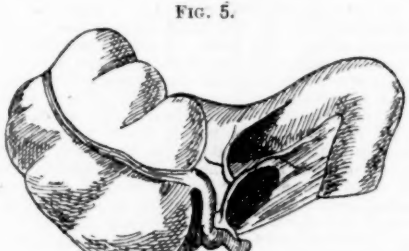
THE PERICÆCAL FOLDS AND FOSSÆ; PERICÆCAL HERNIA.

MR. PRESIDENT AND GENTLEMEN,—The pericæcal folds and fossæ are primary and secondary. The primary folds are vascular in origin; the secondary folds are dependent upon the adhesion, sometimes wanting, between the cæcum and ascending colon and the posterior abdominal wall. The primary folds are found whatever the position of the cæcum may be, the secondary are only present when the cæcum and ascending colon are normally placed. The primary folds are: (1) an anterior, raised up by a branch of the ileo-colic artery as it runs over the anterior aspect of the ileo-colic junction; (2) a posterior, raised up by the artery to the appendix; (3) an intermediate, which is partly muscular and partly vascular in origin; and (4) an accessory anterior fold due to a lateral branch of the ileo-colic artery.

The ileo-colic artery and its branches.—The ileo-colic artery as it approaches the angle of junction of the ileum with the ascending colon gives off as a rule five branches. The precise mode of origin of these branches may vary within considerable limits. The most frequent arrangement is for the vessel to divide into two main trunks which subsequently split up, the anterior into two and the posterior into three branches. The anterior branches are (*a*) a branch running to the left along the upper border of the ileum and (*b*) a branch which continues in the line of the ileo-colic, over the ileo-colic junction. In a few cases the largest offshoot of this latter branch is a vessel which runs to the right on to the colon, forming in its course a well-defined curve with the concavity upwards and to the right. The posterior branches are: (*a*) a branch running upwards to anastomose with the right colic; (*b*) a branch which runs to the posterior aspect of the junction of the ileum with the colon, distributing twigs to the right and left; and (*c*) the appendicular artery which runs in the meso-appendix to the tip of the vermiform process. The chief branch of this last vessel arises close to the lower margin of the ileum and runs with a curve downwards and to the right and again arches upwards and to the left in the ileo-appendicular fold.

The anterior vascular fold (ileo-colic fold or fold of Luschka).—This fold is constant. The younger the subject the better marked the fold as a rule. In the aged and in the obese it may become blurred and flattened, but is always present. It is semilunar in shape, having a curved attachment to the anterior layer of the mesentery, the anterior aspect of the ascending colon, and the cæcum down to the root of the appendix. The free edge of the fold containing the vessel looks to the left and is shorter than the attached margin, representing, as it were, the string of a bow. The fold is thin, sharp, and transparent in the young; thick, dull, and fatty in the aged. In its

FIG. 5.



The ileo-appendicular fold and fossa and the meso-appendix.

upper part are generally one or two small lymphatic glands. The ileo-colic fold is sometimes continued on into the appendix and the vessel it contains replaces the appendicular artery.

The accessory anterior vascular fold.—In 17 cases out of 200 I have met with a distinct fold raised up by the lateral branch of the anterior division of the ileo-colic before referred to. A small fossa lies behind it. Both the fold and the fossa determined by it have hitherto escaped recognition.

The anterior vascular fossa. (Ileo-colic fossa; fossa of Luschka.)—This is a narrow fossa or chink situated between the ileo-colic fold in front and the enteric mesentery, ileum, and a small portion of the upper and inner part of the cæcum behind.

The posterior vascular fold; meso-appendix (Fig. 5).—To see this fold clearly the cæcum and appendix must be turned upwards. It is quadrilateral in shape. Its superior border springs from the mesentery; the right is attached to the colon on its postero-internal aspect for a short distance and then to the cæcum; the inferior to the whole length of the vermiform appendix; the internal or left border is free and contains the appendicular artery. The anterior surface is joined by—

The intermediate fold (Fig. 5); *ileo-appendicular fold.* (Bloodless fold of Treves.)—This is quadrilateral in outline. The upper border is attached to the ileum, opposite the mesenteric attachment for about from one inch and a half to two inches and a half; the lower border extends from the angle formed by the appendix with the cæcum inwards on the anterior surface of the meso-appendix, or occasionally on the appendix itself; the outer or right margin is attached to the inner aspect of the cæcum as far down as the root of the appendix; the left or inner border is concave and free. This latter edge contains the recurrent, or ileo-appendicular, artery given off from the appendicular vessel close to the lower margin of the ileum. Between the two layers of peritoneum in this fold, especially in children, are seen some muscular bundles continuous on the one hand with the cæcum, and on the other with the ileum. In later years so much fat may be deposited between the layers that it forms a solid slab resembling a miniature thickened omentum.

The ileo-appendicular fossa (ileo-cæcal fossa).—This fossa lies between the ileo-appendicular fold and the mesentery of the vermiform appendix. On section it is triangular, being bounded above by the posterior surface of the ileum and the mesentery, in front and below by the ileo-appendicular fold, and behind by the upper part of the meso-appendix. Two cases are recorded in which it is believed that this fossa has become closed at its mouth and subsequently dilated to form a cyst (Schott, Widerhofer).

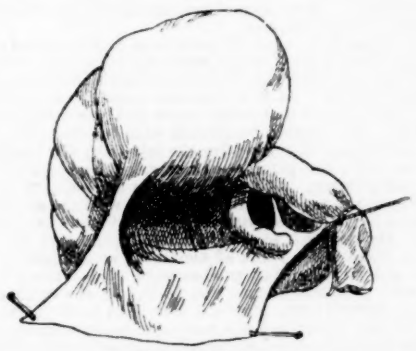
The fossa of Hartmann (fossa ileo-cæcalis infima).—In some cases the lower attachment of the mesentery to the iliac fossa is prolonged into a sharp fold, the "inferior ligament" of Tuffier. Between this fold and the vermiform appendix there may be found a small fossa, funnel-shaped in general, but occasionally sub-divided by a small peritoneal fold (Leichtenstern).

SECONDARY FOLDS AND FOSSA.

On lifting up the cæcum there may be seen:—

The retro-colic fossa (Fig. 6) of variable size and capacity.

FIG. 6.



The retro-colic fossa.

In some cases the whole length of the index finger can be comfortably laid in a sort of peritoneal tube which extends upwards to the kidney. In others there may be merely a narrow and shallow dimple that would contain the tip of a lead pencil. This fossa is bounded and determined by two folds—(1) an outer and upper and (2) a lower and inner.

1. *The parieto-colic fold* (fold of Hensing, superior ligament of the cæcum).—Roughly triangular in shape, this fold contains some tough, strong, shining, fan-shaped fibres. Its posterior border is attached to the abdominal wall from the lower border of the kidney over the iliac crest of the iliac fossa; the anterior or internal border is attached to the postero-external aspect of the colon, extending not seldom on to the cæcum also; the lower free border or base is concave and extends from the iliac fossa to the intestine. The summit or apex is firmly fixed in the lumbar fossa.

2. *The mesenterico-parietal fold* (inferior ligament of Tuffier).—This is in reality the insertion of the enteric mesentery into the iliac fossa. In some cases it is prolonged downwards as far as the inguinal canal in the plica genito-enterica of Treitz. These two folds may be each continued downwards and may coalesce in the formation in the iliac fossa of a falciform fold. In such a case the fossa formed by them would be retro-cæcal, not retro-colic.

Fossa iliaco-subfascialis (fossa of Biesiadecki).—This is situated about the middle of the iliac fossa; its orifice is directed upwards and is bounded in front by a more or less well-defined fold, the inner extremity of which is directed upwards over the psoas towards the root of the mesentery and the outer extends towards the iliac crest. The fossa is about from one and a half to two inches in diameter and is placed at the junction of the upper loose iliac fascia and the lower tense and more firmly fixed portion.

Genesis of the folds.—The ileo-colic fold and the meso-appendix are vascular in origin. The ileo-appendicular fold is more difficult to account for. Luschka believed that it was muscular in origin. Treves asserted that it was the true mesentery of the appendix, the meso-appendix being a substituted mesentery. Jonnesco and Berry consider that the fold is a subsidiary mesentery of the cæcum. Without entering into the reasons I may say that my view is that the fold is of dual origin, that it is primarily muscular, dependent upon the ileo-appendicular muscle, and that later its development is modified by, and attributable to, the ileo-appendicular vessel. This fold is the last to appear in the embryo; it is less constant than the meso-appendix, and it receives its vessel (upon which it to some extent depends for its existence) from the posterior vascular fold.

With regard to the genesis of the retro-colic fossa and the parieto-colic fold I have already stated that they are secondary and are due to the coalescence, sometimes wanting, of the posterior surface of the ascending colon, and sometimes, though rarely, of the cæcum to the posterior wall of the abdomen.

PERICÆCAL HERNIA.

So far as I am aware there are no cases on record which can be considered as hernial protrusions into either the anterior vascular fossa or the accessory anterior vascular fossa. The fossæ are only of anatomical interest. They have no pathology.

With regard to the ileo-appendicular fossa I have already referred to its cystic dilatation. In four cases it has been the seat of a hernia.

CASE 1.—This case was recorded by Tuffier in a meagre and unsatisfactory manner. The patient was a man, aged 50 years, who was very stout. An intestinal loop which measured eight centimetres was contained in this pouch which was very dilated.

CASE 2.—The specimen is in the Musée Dupuytren (*pièce de Michon*). This is referred to by Tuffier as a true specimen of ileo-appendicular hernia. Jonnesco says of it that "it is not very convincing."

CASE 3.—This case was recorded by Dr. Little; Fig. 7 shows the condition. The patient was a man, aged 60 years, powerfully built. For nine days there were symptoms of intestinal obstruction, terminating fatally. "From a point near the tip of the vermiform appendix a narrow but strong whitish band is seen passing to an attachment into the front of the ileum, at a distance of about two inches from the termination of the latter gut." A large loop (16 or 18 inches in length) was strangled by this band, which is evidently the ileo-appendicular fold. The case is very fully and graphically described and remarks are made on the anatomy of this region.

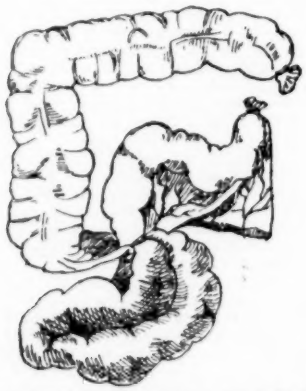
CASE 4.—This case was recorded by Mr. Partridge. A maid-servant, aged 26 years, died after five days' acute

obstruction. A knuckle of the ileum immediately above its termination was found to be strangulated and much congested in consequence of having passed through, and become impacted in, a hole or interspace in the mesentery of the vermiform appendix. The specimen is said to be in the King's College Hospital Anatomical Museum, but it cannot be traced.

There are also many cases of hernia of the vermiform appendix into the pouch.

Hernia into the retro-colic fossa.—Jonnesco accepts the following as genuine cases of hernia into this fossa: one by Fages; one by Wagner; one by Parise; three by Rieux;

FIG. 7.



Dr. Little's case of ileo-appendicular hernia.

one by Engel; one by Klebs; one by Moxon; one by Josse; and one by Furst. On careful perusal of these cases the only ones which can be accepted as being even possibly of this class are the last two recorded by Rieux. All the others are negatived either by paucity and inexactness of description, or they belong quite obviously to a different variety altogether. Moxon's case, recorded by Pye-Smith, is in the Guy's Hospital Museum. It is a beautiful example of right duodenal hernia and has no connexion whatever with the cæcum.

Hernia into the fossa of Biesiadecki.—One example of this was exhibited at the Pathological Society of London by Dr. Mott. It was seen and recognised by Mr. Treves as a hernia into the fossa iliaco-subfascialis. A case recorded by Engel is very probably also of this variety.

Hernia into the fossa of Hartmann.—One case has been recorded by Dr. Snow. A woman, aged 24 years, when in the eighth month of pregnancy was seized with acute abdominal pain which was followed by symptoms of intestinal obstruction, ending fatally on the fourth day. The record of the post-mortem appearances is rather bewildering. I think, however, that only one conclusion is possible and it is that the hernia occurred into the fossa of Hartmann. The case is so accepted by Leichtenstern.

ON THE USE OF DIPHTHERIA ANTITOXIN IN GENERAL PRACTICE,

WITH THE RESULTS OF THE TREATMENT OF 122 CASES OF DIPHTHERIA.

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IT is now generally recognised by the medical profession that the treatment of diphtheria by the injection of antitoxic serum gives far better results than any other treatment and lowers the mortality of the disease in a very marked manner. Antitoxin is now extensively employed in all our large hospitals with a diminishing death-rate, yet judging by the mortality from diphtheria in our large towns and popular centres I cannot help coming to the conclusion that the general practitioner does not employ it as often as he ought and that some do not employ it at all. This has led me to hope that my own experience in the treatment of over 120 cases occurring in my own practice during the last 18 months may prove interesting to brother practitioners and may induce some who have not yet given antitoxin much of a trial to do so at the earliest opportunity, and the result will, I am sure, be a diminished mortality from diphtheria in their own practices.

Up to June, 1897, I had no opportunity personally of judging of the value of antitoxin in the treatment of diphtheria, but during that month and the following months of 1897 an epidemic of that disease occurred in my practice, and I was able to form my own opinion of the value of antitoxin and to watch cases going on side by side, the severe cases being invariably injected by me and the mild cases being treated by the internal administration of perchloride of iron combined with acetate of ammonia (10 minims of the solution of perchloride of iron and one drachm of the solution of acetate of ammonia to half an ounce of water, to be taken every four hours for a boy of 16 years, dose in proportion to age). From June 27th up to Dec. 17th, 1897, I treated in all 42 cases of diphtheria. Of these I injected 22 cases, and did not inject 20, and there occurred six deaths. A glance at the subjoined table will show the relative proportion of deaths in the injected and non-injected cases:—

——	—	Recovered.	Died.	Mortality per cent.
Total number of cases treated from June 27th to Dec. 17th, 1897	42	36	6	14¼
Severe cases and therefore injected with antitoxin serum	22	20	2	9
Mild cases (apparently) and therefore not injected	20	16	4	20

This table shows a total mortality of 14¼ per cent. with a 9 per cent. mortality for the more severe and injected cases and a mortality of 20 per cent. for the more mild and non-injected cases. This table in itself shows the value of antitoxin by the lower mortality of the cases in which it was used and when it is borne in mind that the injected cases were by far the worst cases it is evident that the saving of life must have been very considerable.

TYPES OF CASES INJECTED.

CASE 1.—The patient was a female, aged 19 years, who was first seen on July 18th, 1897, at 9 P.M., and who had a suspicious throat. On the 19th at 11.30 A.M. there were three distinct patches on the left tonsil and two on the right. The temperature was 98° F.; the pulse was feeble. 1500 units of antitoxic serum were injected. On the 20th, 24 hours after the injection, there were no patches at all and the patient felt much better. She made a rapid recovery. This case was seen during the first 24 hours of the disease; injection was early resorted to and hence the membrane disappeared early. The diagnosis was confirmed by subsequent bacteriological examination.

CASE 2.—A male, aged 20 years, was first seen at 4 P.M. on June 26th, 1897. There were suspicious but distinct patches on both tonsils which were enlarged. The temperature was 100·5° F. At 9 P.M. on the same day the patches were quite distinct and were larger and the temperature was 101°. 1500 units of antitoxin were injected. On the 27th at 9 A.M. (12 hours after the injection) the temperature was 101°, one patch was smaller, and a new patch was to be seen growing. At 9 P.M. (24 hours after the injection) the temperature was 103° and the patches were more distinct and were larger, but the patient expressed himself as feeling better. On the 28th, at 9.30 A.M. (36 hours after the injection), there was a speck of membrane at one spot in his throat and all the other patches were gone. The tonsils were red. The temperature was 98·7°. In the evening of the same day (48 hours after the injection) there was not a speck in the throat and the temperature was normal. On the 30th the tonsils were still enlarged but otherwise normal. On July 4th the tonsils were of normal size. This case was seen on the second day of the disease when the antitoxin was injected and the membrane had gone within 48 hours of the injection. The temperature went up during the first 24 hours after the injection, afterwards lowering.

CASE 3.—The patient, a female, aged 13 years, was seen on June 30th, 1897, at 1.30 P.M. The temperature was 102° F. and the pulse was 120 and weak. Three well-defined yellowish-grey patches presented on the left tonsil and there were three smaller ones on the right tonsil. Both tonsils were enlarged and painful. The patient was hoarse. At 3 P.M. I injected antitoxin. The patient was worse. At 11 P.M., eight hours after the injection, the tonsils were larger and more swollen; the patches on the left were much larger and dirtier and on the right they were also confluent. The temperature was 102° and the pulse was 120. The patient was rather hoarser and her breathing was short. On July 1st, at 9.30 A.M. (18 hours after the injection), the temperature was 99°. The patches were to be seen dissolving; they were thinner and smaller, especially at the margins, and only two were left on the left tonsil, the right tonsil being clear. The patient was not so hoarse. At 10 P.M. she was much better. The temperature was 99°. Two small patches on the left tonsil only remained. On the 2nd at 9.30 A.M. (40 hours after the injection) there was only a very small patch on the left tonsil and at 10 P.M. (a little over 48 hours after the injection) there were no patches at all. On the 4th the patient got up out of bed and she did well. She was a very delicate girl and she had suffered from chronic enlargement of the tonsils for years. The diagnosis was confirmed by bacteriological examination.

CASE 4.—The patient in this case was a female child, aged four years. I injected antitoxin on the third day of her illness. Both tonsils were covered with membrane, the breathing was rapid and stertorous, and the larynx was also affected. Distinct improvement took place within 24 hours of the injection although the case was a very bad one, and the patient continued to make rapid progress. The throat and larynx were clear within 60 hours of the injection, and on paying my visit on the fourth day I found the patient downstairs and apparently quite well though a little feeble. She made an uninterrupted recovery.

CASE 5.—The patient, a female child, aged three years, was very hoarse when first seen. The tonsils were enlarged and membrane was filling the throat. The breathing was very laboured, stridulous, and rapid. The patient seemed quite "choked-up." The pulse was very rapid. I injected antitoxic serum at once, it being the third or fourth day of the illness. She remained very ill and in great danger for 24 hours and then she made a rapid recovery. The throat was quite free from membrane within three days of the injection. She developed post-diphtheritic paralysis which persisted for a few months but which eventually disappeared and left her quite as well as before the illness. From the history this appeared to be a case which was primarily laryngeal and secondarily pharyngeal.

CASE 6.—This was a very bad case. The patient was a male, aged nine years. When first seen his breathing was very short. There was a large patch about three-quarters of an inch in diameter on the soft and hard palates following large patches on the tonsils. After the injection of antitoxin rapid recovery took place.

CASE 7.—A male child, aged two and a quarter years, was taken ill on Dec. 7th, 1897, and was supposed to be suffering from a bad cold. On Dec. 10th I was sent for. On that day at noon I examined the child and found an enlargement of the glands at the angle of the jaw and a swelling of the neck. The breathing was short, stertorous, and croupy. On examining the throat internally I found extensive membrane on both tonsils and filling up the throat. I injected antitoxin at 6 P.M. (the fourth day of illness) when he was breathing with difficulty and his pulse was very rapid and feeble. He had a very restless night. On the 11th the throat was still full of membrane, which, however, showed a tendency to separate (less than 24 hours after the injection). On the 12th there was improvement in the patient's condition and on the 13th he was much better. The membrane was disappearing, some being left on one side of the throat only. On the 14th (less than four days after the injection) there was no membrane. On the 15th the child appeared very well. There was a much stronger pulse. The patient developed post-diphtheritic paralysis, but eventually he got all right after a few months. This was a very bad case. The antitoxin was not injected until the fourth day of the illness and yet the patient did very well.

TYPES OF CASES NOT INJECTED.

CASE 1.—The patient was a male, aged 13 years. There were patches on one tonsil. This was a mild case. I prescribed seven minims of the solution of perchloride of iron and 30 minims of the solution of acetate of ammonia to half an ounce of water every four hours. The throat cleared in from three to four days.

CASE 2.—A male, aged 11 years, was taken ill on Sept. 24th, 1897. He was seen by me on Sept. 26th, when I found a fair pulse, patches on the tonsils, and the general condition pretty good. I did not think him ill enough to order an injection and therefore ordered perchloride of iron and acetate of ammonia and brandy. On the 27th the patches in the throat were larger and the pulse was not so good. On the 28th there were large new patches, the pulse was feeble, and the heart was inclined to be weak. On the 29th the patches were beginning to grow smaller. They were still present on the 30th and there was a fresh one on the uvula. The general condition of the patient was not so satisfactory as one would wish. On Oct. 1st there were two patches on the uvula. The patches on the tonsil were thinner. The heart was slow and weak. On the 3rd the patches had nearly gone but there was a trace on the right tonsil. The patient's general condition was improving. On the 4th the patches had disappeared and improvement was still going on.

This case which equalled in its severity at the onset some of the very mildest cases injected does not compare favourably in its clinical history with the more severe injected cases. The patches, instead of clearing up in two or three days at farthest, as would probably happen with antitoxin, took seven days to disappear and they spread on to the uvula in addition and the condition of the patient was also critical for a few days from weak and slow heart.

CASE 3.—The patient in this case was a female, aged four years. When I saw her on Sept. 27th, 1897, there were small patches on the tonsils. I ordered perchloride of iron and acetate of ammonia and brandy every four hours. This was an apparently mild case. On the 28th and 29th the patches were larger and the pulse was feeble. On the 30th the throat was much the same, but the patient was better in herself—her general condition had improved a little. On Oct. 4th the patches still persisted and the patient was much the same. On the 5th the patches had nearly gone and there was slight improvement. On the 6th the patches had disappeared and the patient was all right.

The patches took nine days to clear up and the patient was in a feeble condition throughout, giving me more anxiety for a time than the very bad injected cases had done.

CASE 4.—The patient was a male, aged 18 years, who was seen by me on Sept. 29th, 1897. There was a patch in the throat. I ordered the mixture as in the previous cases. On the 30th there were a few patches. On Oct. 1st the patches were much the same, on the 2nd they were not so large, on the 3rd they were fading, and on the 4th they had gone.

In this case, which was a very mild one in an adult, it took five days for the patches to disappear.

CASE 5.—The patient was a male, aged five years. On Oct. 6th, 1897, the throat was inflamed, but there were no patches. I ordered the same mixture as in the previous cases. On the 7th there were well-marked patches on both tonsils and the breathing was rapid and feverish. On the 8th the patches were well marked and the heart was weak. He recovered slowly and gave me much anxiety owing to his heart becoming very feeble, and there were still thin patches on the pillars of the fauces on Oct. 14th, eight days from the onset of the illness and from the time when treatment commenced. He eventually got all right.

NOTES OF ALL THE FATAL CASES.

Fatal cases injected.

CASE 1.—I was called to see the patient, a female, aged two years, at 5.30 P.M. on June 30th, 1897. The pulse was rapid and the temperature was 98° F. The breathing was croupy, respiration was very rapid and difficult, the throat was a good deal swollen externally, and there were enlarged glands. On examining the throat internally I found it to be full of yellowish-grey patches scattered over both tonsils which were also enlarged. The larynx was evidently primarily badly affected and the disease was now spreading to the throat (the patient had been ill for a few days). At 7 P.M. I injected 1500 units of antitoxin. At 10.30 P.M. she was more collapsed than she had been. The temperature was 97° and the breathing was very stertorous and difficult. On examining the throat I found the patches to be confluent and the throat to be simply full of dirty membrane and slough. The child was gasping and appeared to be almost dead. There was great sucking in of

the intercostals. I injected 1500 units more of the antitoxin. On July 1st, at 1 P.M. (17 hours after the first injection) I found the child still alive. The throat was almost clear of membrane and the breathing was very much easier and slower but the child was sinking and almost dead from exhaustion and heart failure. The temperature was 100°.

In this case it was evident that I had been called in too late, yet though the case was so severe and the child was nearly dead when first seen she lived until the following day and died when the disease was practically gone, 17 hours after the first injection. I thought she would have died fully 12 hours sooner.

CASE 2.—A female child, aged 15 months, was seen by me on July 25th, 1897, and was found to be suffering from a very bad attack of membranous croup. To all appearances she was dying. There was great sucking in of the intercostals in respiration. I injected antitoxin. On the 26th the breathing was better, but the child was very weak and collapsed and eventually she died of collapse and exhaustion 24 hours after the injection.

It will be noticed that in this case the patient lived for 24 hours after the injection of the antitoxin.

Fatal cases not injected (practically).

I look upon the following four cases as not injected, as they were treated with the solution of perchloride of iron and the solution of acetate of ammonia for several days and then injected when too late to be of value.

CASE 1.—I was called in to see a male child, aged four years, who was known to have been suffering from diphtheria for five days at least and after he had been treated with local applications to the throat and the solution of perchloride of iron internally. I found large dirty-greyish patches on both tonsils; they were distinctly membranous. I ordered the solution of perchloride of iron and the solution of acetate of ammonia and brandy internally. The pulse was feeble. On the following day more membrane was discovered in the throat and the pulse was weak. On the eighth day of illness (the third day of my attendance) the membrane was still there and the patient was getting much weaker. I injected 1500 units of antitoxin. On the ninth day the throat showed improvement, but the patient had developed passive congestion of the lungs. On the tenth day he sat up in bed at about 3 A.M. and fell back dead.

This was a case to which I was called not sooner than the sixth day of the disease. As the patient had already been attended by a medical man I unfortunately did not inject antitoxin when called in but left him for two more days without injection. It was quite impossible to keep this patient in bed and whenever I called to see him he was always dressed and lying on the sofa or sitting or walking. His parents did not seem to realise that there was much danger although I impressed it on them daily. If the antitoxin had been injected a few days earlier I believe he would have recovered.

CASE 2.—The patient was a male, aged four years, who was just recovering from scarlet fever. He was first seen on Sept. 21st, 1897. There were two large patches on the tonsils. I suspected diphtheria and I put the patient on perchloride of iron and acetate of ammonia. On the 22nd he was seen by my assistant and was reported as being much better When I next visited him (on the morning of the 24th) I found him to be very ill indeed. The throat was almost choked up with membrane and the neck was swollen; breathing was difficult and very short and rapid. The pulse was weak and irregular. I injected antitoxin (fifth day). He had a bad night. On the 25th he was rather better; the patches were disappearing and the breathing was easier. He got up out of bed to micturate and was taken suddenly worse. He died in the evening from heart failure—30 hours after the injection.

The fact of the patient having been left too long before the injection of the antitoxic serum may perhaps be held accountable for the fatal issue in this case.

CASE 3.—The patient, a male, aged three years, was first seen on Oct. 4th, 1897. The throat was inflamed and there was a patch. The mixture and the brandy were ordered as in the former cases. On the 5th there were well-marked patches and the patient was feverish. On the 6th he was worse and the patches were larger. On the 7th the patches were fading anteriorly in the throat but they were still well marked posteriorly. On the 8th he appeared to be better but still there were patches present. On the morning of the 9th he was better. At 7 P.M. the breathing was noticed to be difficult and croupy and he became more restless and got gradually worse until I was sent for at 7 A.M. on the 10th. I found that the membrane had extended into the larynx and I injected antitoxin, but he got gradually worse and died 24 hours afterwards from asphyxia and exhaustion.

On Oct. 7th, 8th, and 9th the patient had appeared much better and had cried the greater part of the time, wishing to get up. This was in the early stages of the illness. It was a comparatively mild case and the patient would, I feel certain, have recovered with the injection of antitoxin earlier.

CASE 4.—The patient was a female, aged one year and 11 months. On Oct. 4th, 1897, the throat was bad, there were patches, and the neck was swollen. On the 5th, there were well-defined patches on both tonsils, and on the next day they were more marked. On the 7th, large greyish yellow patches were raised up on both tonsils. The pulse was rapid and weak. On the 8th the patient was very ill. The throat was full of membrane, extending to the larynx. On the 9th she seemed a little better; there was less membrane in the throat. On the 10th I was sent for at 5 A.M., when I found the breathing to be difficult and croupy. At 7 A.M. I injected antitoxin. She got gradually worse; stridor and difficulty of breathing set in, the larynx got choked up, and she died from asphyxia at noon. The throat was full of membrane up to the end.

This case did not seem to be a very severe one at the beginning, so I treated it with the mixture and the brandy as in the other cases, and injected antitoxin when too late (on the sixth or seventh day). If it had been injected earlier the patient would probably have done well.

A glance at the clinical history of the above types of injected and non-injected cases will show that the injected cases (although much more severe) did much better than the non-injected cases and that they recovered in a much shorter time and gave me much less anxiety. The throat cleared up in the injected cases on an average in less than half the time which it took to clear up in the non-injected, and I felt quite happy about the injected cases after the first 24 hours, as a rule, while I never knew what was going to happen to the non-injected cases often for more than a week. The four fatal non-injected cases quoted above show the dangers of leaving even a mild case for any length of time non-injected, and it was the history of those four cases that led me to use antitoxin more frequently and with much better results from that time up to the present. The average time for the membrane to disappear from the throat after injection was two and three-quarter days; in the non-injected cases it averaged five and two-third days from the commencement of the treatment. The disappearance of the membrane seemed in both classes to mark a distinct improvement in the patient's condition; in the injected cases the patient was practically convalescent then, while the weak heart caused anxiety for some time longer in the non-injected cases. In the former class the patients were generally going about during the second week, while in the latter it was often not until the third or fourth week. The great danger in the non-injected cases, however mild apparently, was the shaky and feeble heart. Very rarely was there this danger in the injected cases after the first day or two. As a matter of fact, I often found the latter going about against orders after the first two or three days and yet there were no bad effects. The subjoined table tabulates these points and shows at a glance the value of antitoxin:—

—	Severe cases injected.	Mild cases non-injected.
Disappearance of membrane averaged... ...	2¾ days.	5⅔ days.
Recovery...	1 to 2 weeks.	2 to 4 weeks.
General condition during attack	Good after the first day or two.	Unsatisfactory for a week or two.
Condition of the heart	Regular and satisfactory after the first few days.	Shaky and weak for over a week and unsatisfactory for a week or more longer.
How long confined to bed...	One week or so.	2 weeks or more.
Mortality	9 per cent.	20 per cent.

My experience in these 42 cases taught me the value of antitoxic serum in the treatment of diphtheria and taught

me to inject it in all except the very mildest cases with a much lower death-rate than in these 1897 cases. A large number of these cases were examined bacteriologically for the diphtheria bacillus and it was found in nearly every case examined.

During 1898 from Jan. 1st to Dec. 31st I treated in my practice 80 cases of diphtheria, many of them of a very severe type and primarily laryngeal and the very worst forms of the disease, and I had only three deaths during that period, or a mortality of 3¾ per cent. Of these 80 cases I injected 55 and treated the other 25 with the solution of perchloride of iron and the solution of acetate of ammonia and brandy internally and did not inject the antitoxin—i.e., I injected 68¾ per cent. of the cases. In two of the fatal cases the parents refused to have the antitoxin injected when I wished and advised it and although I warned them that their children would most likely die if they persisted in refusing an injection. After losing three or four days of valuable time they consented, but it was too late and the children died. In the third fatal case the boy was injected once and the case being a very bad one I advised a second injection which the parents refused to agree to and the patient died. I believe that he would have recovered with a second injection. Hence but for the ignorance and prejudice of the parents of these three children the mortality in 1898 would probably have been *nil*. As it was it was only 3¾ per cent., compared with 14¾ per cent. in 1897. These three deaths occurred in January, 1898, and from Jan. 26th to Dec. 31st of that year 72 consecutive cases were treated without a single fatality and I attribute this to the injection of antitoxin in a very large proportion of the cases. The subjoined table shows the proportion of cases injected:—

—	—	Recovered.	Died.	Mortality.
Total number of cases treated from Jan. 1st to Dec. 31st, 1898	80	77	3	3¾ per cent.
Severe cases injected	55	54	1	Under 2 per cent.
Mild cases non-injected	25	23	2	8 per cent.

I look upon the two who refused injection until too late as non-injected.

In 1897 I injected 52 per cent. of all my cases, while in 1898 I injected 68¾ per cent. of my cases, hence the mortality in 1898 of 3¾ per cent. compared with 14¾ per cent. in 1897. Taking the whole of the cases treated from June, 1897, to Dec. 31st, 1898, with and without antitoxin, there were 122 cases with nine deaths, or a mortality for the whole period of 7½ per cent.

On referring to the annual report of the medical officer of health for the Rhondda Valley for the year 1897 I find that during the year there were reported in that district 247 cases of diphtheria with 78 deaths, or a mortality of over 30 per cent. Dr. Louis Cobbett's paper in THE LANCET of Dec. 3rd, 1898, in comparing the mortality of London from diphtheria with that of Berlin gives the deaths in London in 1897 as 2328 out of a total of 13,192 cases reported, or a mortality of over 17½ per cent. A glance at these mortalities seems to me to have but one explanation—viz., that the general practitioners of the day do not employ antitoxin as often as they ought to do in the treatment of diphtheria and do not seem to recognise the value of the sovereign remedy which they have at their disposal.

In my cases I injected 1500 units of antitoxic serum (Burroughs, Wellcome & Co.) under the skin of the abdomen and I always used the liquid, not the dried, serum. This I found generally enough to cure the patient and in only five cases out of the 77 injected was a second injection called for after an interval of from two to three days. If the patient does not show a marked tendency towards improvement within 24 hours of the first injection or if the membrane does not clear up by the third or fourth day a second injection is indicated.

Nine of my cases developed post-diphtheritic paralysis and one of them, a very delicate child, developed pneumonia about the ninth week and died. I have not seen any bad effects follow the use of antitoxin. Rashes occurred in some of the cases—in one instance typically scarlatinal and accompanied by acute pains in the joints with tenderness and an elevation of temperature. This occurred about 10 days after the injection of the antitoxin and passed off in a couple of days. I also noticed the elevation of the temperature during the first twenty-four hours after injection, and after that a distinct lowering and the patients nearly always expressed themselves as feeling better within 12 hours of the injection.

The question may be asked, Ought antitoxin to be injected in every case of diphtheria? Some of the cases are sufficiently mild, in my opinion, to recover without it, so I will not go so far as to say that it is absolutely essential to inject in every case, although I would call it an excellent practice to do so and the patients would make much more rapid recoveries. I think that in every case, however mild, the patient ought to have the option of an injection and that injection ought to be insisted upon as early as possible in every case that is at all severe or likely to prove so and I think that the medical man who does not employ antitoxin and who loses a large proportion of his cases is incurring a responsibility which is almost criminal. The earlier a patient is injected the greater is the chance of recovery and the more rapid is the recovery.

Forty of the 1898 cases occurred in a branch practice and my success in their treatment is due in a great measure to the careful diagnosis and help rendered by my branch assistant, Mr. J. W. Collingwood Barrett. I might add that I invariably kept my patients on perchloride of iron and acetate of ammonia and brandy administered internally in addition to injecting them.

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OBSERVATIONS ON THE CEREBRO-SPINAL FLUID IN THE HUMAN SUBJECT.[1]

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ONE of us (Dr. StClair Thomson) has had under his care for some years a young woman who has suffered from continuous dripping from the nose. The case has not been amenable to any treatment. At first it was thought to be one of nasal hydrorrhœa but certain characters in the affection convinced the observer that this could not be so and that the fluid (which dropped from one nostril only) was cerebro-spinal fluid. This was supported by the results of the chemical examination of the fluid. The escape of cerebro-spinal fluid from the nose has long been known to follow traumatic injury to the cribriform plate of the ethmoid bone, but the possibility of its spontaneous escape from the nose does not appear to have been fully established before the present instance. However, considerable research into the literature of the subject has shown that there are several cases recorded in which, though no history of injury existed, the flow of fluid from the nose was of such a character that they must have been similar to the present case, although in the majority of instances the true nature of the fluid escaped observation.

Many of these patients exhibited cerebral symptoms in the course of the disease, and some ultimately died from inflammation of the cerebral meninges, which had probably spread from the nose through some opening in the bony lamina that normally separates the cranial and nasal cavities. The full clinical details of this rare case and of the similar ones just referred to are, however, reserved for publication elsewhere. The present paper is concerned only with the composition of the fluid and the variations it presents under different circumstances.

Characters of the Fluid.

Our opportunities for examining the fluid chemically have been fairly frequent. The fluid was always collected in

[1] A paper read before the Royal Society on Feb. 16th, 1899.

sterilised glass vessels and the examination was made as soon as possible by one of us (Dr. W. D. Halliburton) at King's College, London. The fluid is perfectly clear and colourless, looking like water; its reaction is faintly alkaline; its specific gravity is about 1005. On microscopic examination it shows no cells or other deposit. It gives no precipitate with acetic acid. It contains a trace of proteid, coagulable by heat, but the quantity is too small to give more than an opalescence. In another portion of the fluid it was ascertained that this proteid is precipitable by saturation with magnesium sulphate; it is therefore a globulin. Albumin and other proteids are absent. The fluid contains a substance which reduces Fehling's solution. A portion of the fluid was treated with excess of acidified alcohol; the proteid so precipitated was filtered off. The filtrate was evaporated to dryness over a water bath; the dry residue was taken up with alcohol, filtered, and again evaporated to dryness. Part was evaporated to dryness on a glass slide; the residue examined microscopically was seen to contain the needle-like crystals, occurring singly and in bundles, similar to those previously described and figured by one of us (Dr. W. D. Halliburton)[2] as obtainable from cerebro-spinal fluid. The residue had also the characteristic pungent taste of pyrocatechin. The remainder of the dry residue was dissolved in water and filtered. The filtrate reduces Fehling's solution well, but it does not ferment with yeast nor does it give any osazone crystals on treatment with phenylhydrazine hydrochloride and sodium acetate. Control experiments with a weak solution of dextrose, which gave about the same amount of reduction with Fehling's solution, gave both these tests in a typical way. The fluid was tested for creatinine with negative results.

The same results relative to the reducing substance have been obtained over and over again in various specimens of this fluid. They agree with the observations of nearly all writers on the cerebro-spinal fluid, but differ from those of Nawratski[3] who in a recent paper has affirmed, principally from observations on the cerebro-spinal fluid of the calf, that the reducing substance present is dextrose.

The principal points to be noticed in the properties of the fluid which lead to the conclusion that it is cerebro-spinal fluid are the following: (1) its clear, watery character; (2) its low specific gravity; (3) the small amount of proteid in it and the absence of albumin; and (4) the presence in it of a substance which reduces Fehling's solution, but is not dextrose—it is possibly a substance related to pyrocatechin. In comparison with this fluid we examined also the secretion in some cases of true nasal hydrorrhœa. This fluid is opalescent, somewhat viscid, and on microscopic examination shows amorphous matter with mucous corpuscles. It gives with acetic acid a precipitate of mucinoid nature. It sometimes does and sometimes does not contain a reducing substance, and this substance when present is sugar. A quantitative analysis of one of these nasal fluids showed that the percentage of solids, especially organic solids, is higher than in cerebro-spinal fluid. The results of the analysis are as follows:—

Water	98·792 per cent.
Total solids	1·208 ,,
Proteids (including mucin)	0·260 ,,
Other organic substances	0·163 ,,
Inorganic substances	0·785 ,,

Our observations on the characters of the cerebro-spinal fluid were followed by others in which we sought to answer the following questions: the rate of flow; the difference of composition at different times of the day; the influence of straining, posture, and abdominal compression on the flow and composition of the fluid; and the effect on blood-pressure of intravenous injection of the fluid in animals.

The Rate of Flow.

One portion, collected by the patient herself in the course of an hour, measured four cubic centimetres. Another portion, collected under the supervision of one of us (Dr. StClair Thomson) in 10 minutes, measured 3·9 cubic centimetres. If the first portion is taken as a measure of the rate of secretion the amount formed in the day will be 96 cubic centimetres. Taking, however, the second observation as being more accurate the amount formed in the 24 hours will be over half a litre (561·6 cubic centimetres). It is possible that this estimate is too high, as doubtless the patient, being under the observation of a physician, would be somewhat excited and the consequent alteration of the circulation would, as we shall immediately see, cause the flow to become more abundant.

Comparison of the Morning and Evening Fluid.

Cavazzani,[4] from experiments on dogs, found that the cerebro-spinal fluid collected in the morning was more alkaline than that collected in the evening and that it contained more solid residue. He considered that this was related to the activity of the nervous system and that it confirmed Obersteiner's theory of sleep. He obtained corresponding results in the case of a man with traumatic fistula of the frontal bone. We considered it worth while to repeat this observation. The qualitative examination of the fluid collected the first thing on several mornings gave the same results as that of specimens collected the last thing in the evening. Both were distinctly alkaline but no estimation of the relative alkalinity was made. The following table gives in percentages the results of the quantitative analyses:—

	Morning fluid.	Evening fluid.
Water...	99·004	99·027
Solids...	0·996	0·973
Organic solids	0·118	0·100
Inorganic solids	0·878	0·873

The evening fluid is thus slightly poorer in both classes of solid constituents than that of the morning; the difference is chiefly due to an alteration in the organic solids. This is just what we should expect, as the decreased capillary pressure during sleep would lessen the rate of exudation of water. Without committing ourselves to any theory on nervous activity or sleep we may say that our experiments confirm those of Cavazzani.

The Influence of Straining and Posture on the Flow and Composition of the Fluid.

In a monograph on the cerebral circulation[5] one of us (Dr. Leonard Hill) put forward the view that the rate of secretion of the cerebro-spinal fluid, when the cranio-vertebral cavity is opened, depends directly on the difference between the pressure in the cerebral capillaries and that of the atmosphere. At the same time it was shown that cerebral capillary pressure varies directly and absolutely with vena cava pressure. Thus the cerebral capillary pressure can be raised with great ease by any agency which causes a rise of pressure in the vena cava or cerebral veins. On the other hand, cerebral capillary pressure varies directly, but only proportionately, with aortic pressure, for between the aorta and the capillaries there lies the peripheral resistance.

It follows from the above that the easiest methods of raising the cerebral capillary pressure in man are: (*a*) by compression of the abdomen; (*b*) by the assumption of the horizontal posture (in this position, however, the rise of venous pressure may be compensated by the fall of arterial pressure which normally occurs when the body is at rest; this is, no doubt, the case during sleep); and (*c*) by straining or forced expiratory effort with the glottis closed. By all these methods the vena cava pressure is considerably raised; and by the last method the venous inlets into the thorax may be completely blocked and the pressure in the cerebral capillaries raised to something like aortic pressure. It is true that by such a forced expiratory effort the aortic pressure is lowered. Nevertheless, the total effect on capillary pressure is a very great rise, for a fall of aortic pressure of 25 millimetres of mercury produces a fall in cerebral capillary pressure of less than five millimetres of mercury, while a rise of vena cava pressure of 25 millimetres of mercury produces a rise of cerebral capillary pressure of 25 millimetres of mercury.

The present case gave us a unique opportunity of testing the correctness of these views on the living human subject and our experiments entirely confirm them. As will be seen from the following figures, the flow of cerebro-spinal fluid is accelerated by all those circumstances which raise the cerebral capillary pressure. The increase in flow is, moreover, accompanied by a decrease in the percentage of solid matter. The experiments were conducted under the supervision of two of us (Dr. StClair Thomson and Dr. Leonard Hill); the chemical investigation of the fluid was performed, as before, by the third (Dr. W. D. Halliburton). 1. The patient was sitting quietly without straining. In five minutes 23 minims (1·357 cubic centimetres) were collected. 2. The patient was sitting and straining. In five minutes 35 minims (1·965 cubic centimetres) were collected. 3. The patient was sitting quietly. In five successive

[2] Journal of Physiology, vol. x., p. 248.
[3] Zeitschrift fur physiologische Chemie, 1897, vol. xxiii., p. 532.
[4] Sul Liquido Cerebro-Spinale, La Riforma Medica, Anno viii., 1892, vol. ii., p. 591.
[5] The Physiology and Pathology of the Cerebral Circulation, by Leonard Hill. London: Churchill, 1896.

minutes the amounts collected were respectively eight, seven, five, five, and five drops. The total measured 19 minims (1·021 cubic centimetres). 4. Subsequently to this five minutes were occupied by the patient in straining and the amounts collected in consecutive minutes were 12, 10, eight, nine, and 10 drops respectively. The total measured 33 minims (1·947 cubic centimetres). 5. The patient was lying down and not straining. The drops fell as follows in five consecutive minutes—nine, six, five, five, and five, and the total measured 27 minims (1·593 cubic centimetres). Here the arterial pressure was probably not decreased owing to mental excitement, while the cerebral venous pressure was increased. 6. The patient was lying flat on the stomach and the head was hanging over the end of a sofa. The drops fell as follows in five consecutive minutes—eight, seven, six, seven, and seven. The total measured 28 minims (1·652 cubic centimetres). 7. Finally, after the last experiment, the following was collected during quiet dropping while the patient was sitting with the head forward. The drops fell as follows—five, four, four, four, and four in five successive minutes, and the total measured 15 minims (0·885 cubic centimetres).

The following is the report on the chemical examination of the fluids. So far as the small quantities available admit of analysis the fluids are the same qualitatively. The liquid which escaped passively and that which passed under straining both contained a small quantity of organic and inorganic solids. Among the organic substances present are the reducing substance and a trace of proteid. Judged by the amount of precipitate produced by alcohol in equal amounts of the two fluids the proteid is less abundant in the fluid passed during straining, but the amount is too small to weigh.

Determination of the total solids gave the following results expressed in percentages:—(*a*) the fluid passed passively, 1·1 per cent.; and (*b*) the fluid passed during straining, 0·43 per cent. Even the higher of these numbers is less than in cases of cerebro-spinal fluid from meningocele and hydrocephalus previously recorded by one of us (Dr. W. D. Halliburton.)[6]

In addition to the foregoing two specimens were collected at home by the patient herself. Analysis of these gave the following results:—*A*. Fluid collected while the patient was sitting upright quietly. The percentage of solids was 1·11. *B*. Fluid collected while the patient was lying down. The percentage of solids was 1·03. The effect of the horizontal posture is in the same direction, though not so marked as the effect of straining. This is what was to be expected, for the horizontal posture would not raise the venous, and thus the cerebral, capillary pressure so much as powerful expiratory efforts would. Moreover, the arterial pressure falls during quiet rest in the recumbent posture, as one of us (Dr. Leonard Hill) has determined.[7] In order to note the effects of straining on the retinal circulation Mr. Vernon Cargill was asked to examine the patient and he kindly reported as follows: "I noticed that when a straining effort was made a decided but transitory narrowing of the retinal arteries on and adjacent to the disc and also a marked pulsation in the trunks of the retinal veins occurred." The transitory narrowing of the arteries points to the temporary lowering of the aortic pressure, while the pulsation of the veins is a sign of the capillary engorgement due to venous congestion.

Experiments made with Abdominal Compression.

These experiments were made in order to complete and confirm those just recorded. The patient was seated and the abdomen was compressed as firmly and evenly as possible by one of us (Dr. StClair Thomson) spreading both hands over the front of the abdomen. The number of drops per minute were counted as before and periods of compression lasting five minutes were alternated with periods of the same duration, during which the patient was sitting quietly.

The following table gives the results succinctly:—

Condition of patient.	Drops in successive minutes.	Total collected.	
		Minims.	c.c.
A. Abdomen compressed ...	11, 9, 8, 7, 5	27	1·593
B. Sitting quietly	4, 5, 3, 4, 4	14	0·826
C. Abdomen compressed ...	11, 8, 8, 6, 6	24	1·416
D. Sitting quietly	6, 7, 8, 6, 6	Measurement omitted.	

[6] Journal of Physiology, vol. x., p. 232.
[7] Proceedings of the Physiological Society, Jan. 15th, 1898.

The fluids from experiments *A* and *C* were mixed together; also those from experiments *B* and *D*. Determination of the total solids gave the following results:—*A* and *C*: In fluid collected during abdominal compression the percentage of solids was 0·68. *B* and *D*: In fluid collected while the patient was sitting upright quietly the percentage of solids was 1·14. The experiments confirm those recorded in the preceding section. Abdominal compression raises the vena cava pressure and so leads to increased cerebral capillary pressure, and in this way to increase in the volume of the cerebro-spinal fluid secreted. Increase of volume, as before, is accompanied with fall in the percentage of solids present.

Intra-vascular Injection of the Cerebro-spinal Fluid.

One of us (Dr. W. D. Halliburton), in conjunction with Dr. Mott, F.R.S., has been for some time engaged in examining the results of injecting into animals cerebro-spinal fluid removed from cases of brain atrophy, especially from cases of general paralysis of the insane. This fluid contains a toxic substance (choline), doubtless derived from the disintegration of lecithin in the brain. Injection of such fluid into the jugular vein of animals (dogs, cats, and rabbits) anæsthetised with ether causes a marked lowering of arterial blood-pressure which is partly cardiac in origin, but principally due to the local action of the poison on the neuro-muscular apparatus of the peripheral vessels, especially in the splanchnic area.[8] The fluid obtained from the present case was also injected in a similar way. Quantities varying from seven to 10 cubic centimetres were injected into the circulation in dogs but with entirely negative results. Such a quantity in the case of fluid from a general paralytic would be quite sufficient to cause a marked fall of arterial pressure. Similar negative results, both as regards blood-pressure and respiration, were obtained with other specimens of normal cerebro-spinal fluid removed from other animals or from cases of meningocele and hydrocephalus in children. In all such cases, also, choline was searched for chemically but with negative results.

ON ACUTE AFFECTIONS OF THE SKIN AND MUCOUS MEMBRANE OF THE MOUTH IN AN EARLY STAGE OF MYXŒDEMA;

PRIMULA OBCONICA AN ALLEGED EXCITING CAUSE IN ONE CASE.

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As far as I am aware cases such as the two following have not hitherto been observed in connexion with myxœdema, the reason no doubt being that the early stages of this malady have generally been overlooked. Fortunately, the importance of its early diagnosis has lately been brought into deserved prominence by Dr. G. R. Murray.[1] An additional matter of interest in the cases here recorded will be found in the evidence apparently afforded by one of them of the great susceptibility on the part of a myxœdematous subject to the irritant action of the leaves of the primula obconica.

CASE 1.—The first part of the following account is derived from notes which were carefully taken at the moment of observation and which were meant for earlier publication, an intention, however, which was postponed from the desire to wait for further developments which might throw fresh light on some puzzling features of the case. The patient, an unmarried woman, aged 39 years, first came to my consulting-room on April 21st, 1893. The first glance at her swollen lips and her first efforts at speech seemed immediately to stamp the case as one of myxœdema and this opinion was strengthened by the fact that she was the sister of a cretin whose case I reported in 1884.[2]

[8] Proceedings of the Physiological Society, February, 1897, and February, 1898 (Journal of Physiology, vols. xxi. and xxii.).
[1] On the Diagnosis of Early Thyroidal Fibrosis, Brit. Med. Jour., vol. ii., 1898, p. 942.
[2] THE LANCET, August 23rd, 1884, p. 314, where an illustration is given.

and who died in an extremely swollen condition. A look into her mouth showed that the tongue and especially the soft palate and uvula were much swollen and the threatening aspect of the case induced me to send her straight home. Visiting her there an hour afterwards I ascertained that she had had a similar but much milder attack a week previously which had passed off in 24 hours. Both attacks commenced very suddenly and in neither was there any preceding rigor. The day before the present seizure she had been exposed to cold in a boat, but there had been no such exposure on the previous occasion. On the morning of this second attack menstruation had commenced although it was not due for a week longer (this being a novel occurrence with her), and four hours later she suddenly felt giddy and was obliged to lay hold of something for support, but this passed off in half-an-hour. Two hours later she suddenly felt her lips "blister," as she expressed it, when she touched them with her tongue and they swelled up to twice their usual size in five or 10 minutes, her throat became dry, and swallowing was difficult, and in half-an-hour there was a burning pain in both the tongue and the throat, most severe at the tip of the former. She was now in great distress and alarm, feeling as if she would soon "close up" altogether. I now found that the enlarged uvula had become very red and vascular in the brief interval which had elapsed since my previous examination. The lips were enormously swollen, the upper being traversed by a transverse furrow dividing it into two large ridges, while the lower, still more thickened, was much everted and covered with a copious tenacious mucus manifestly oozing from the inflamed surfaces. The swelling was almost completely submucous and not cutaneous, while the gums, the buccal mucous membrane, and the hard palate were practically unaffected. The anterior half of the tongue was of twice the usual thickness and very moist, this thickening being most marked on the lower surface, which presented the appearance of two considerable longitudinal ridges with a central furrow, an exaggeration of the normal condition. The papillæ were very prominent on the upper surface, giving rise to a strawberry appearance as in scarlet fever. The posterior half of the tongue seemed almost normal, a well-defined transverse line demarcating the two halves. On the soft palate or at its junction with the hard there were two distinct oval, red, vascular patches on each side of the middle line, elongated from before backwards and a little larger than horse-beans. There was a clear space between these and the enlarged and vascular uvula. The pillars of the fauces were slightly reddened but the tonsils, pharynx, and the parts beyond were quite unaffected. The patient said that the tongue felt as if a hot cinder were lying on it. She was hawking and spitting incessantly a large quantity of viscid saliva. There was no difficulty in breathing. Speech was impaired and the sense of taste was nearly lost, while she could bear nothing in the mouth but cold water and milk which relieved the burning sensation. The lower half of the face appeared to be swollen and there was some fulness below the chin, but the upper half of the face and the eyelids were unaffected. The right submaxillary gland was enlarged and somewhat tender but not the left; there was no swelling of the parotids. There was no tenderness over the thyroid and I was doubtful if the gland could be felt at all. The pulse was 60 and feeble, as also were the cardiac sounds. The temperature, which was taken with scrupulous care, was 99° F. in the mouth and 98·6° in the axilla. There was very considerable thirst. An aperient with the use of iced water and milk was ordered.

It was chiefly during subsequent visits that the previous history of the patient was elicited, but the sequel will be better understood if it be inserted here. She first of all stated that she had always been in good health until the present attacks, so that had I been satisfied with this and been content to regard the myxœdematous aspect as due only to the present acute swelling, as no doubt it was to a large extent, I would have failed to apprehend the real nature of the case. On inquiry it turned out that she had had a dry and scaly state of the skin of the face, forearms, and hands for five or six years, for which she had used glycerine every night, while an eruption of reddish watery spots frequently broke out about her wrists. At the same time she had not felt so strong as formerly; her appetite had failed; she had become very susceptible to cold, often feeling shivery; she was easily fatigued and had become slow in walking, but without unsteadiness of gait. Speech was unimpaired, but she had a bad taste in the mouth and was troubled with a copious tenacious saliva which even trickled from her mouth and moistened the pillow at night. Her complexion had become yellowish of late. There were two well-marked pink areas on the cheeks, and when I called her attention to these she said that they had always existed but that they grew excessively bright of late if she was near a fire. She had grown stouter within the last few years with a tendency to a "hanging" chin, but the lips and eyelids had never been swollen although her sister had often remarked a blueness of the lower lids. In September, 1892, she first experienced a "blistering" of the lips as felt with the tongue with a peculiar sensation of smoothness about the latter. This would last a few hours and return in a few days or weeks. Her hair and nails were normal with only slight brittleness of the latter. The memory was slightly impaired. The inquiry was further directed to the various other symptoms and appearances of myxœdema as enumerated in the exhaustive report of the Clinical Society of London and with negative results.

To return to the present acute affection: the same evening the throat and tongue were worse and the patient was protruding the latter frequently to cool it. A dose of thyroid extract corresponding to one-twelfth of a lobe of the sheep's gland was administered. (This was prepared by myself the same day. The acute symptoms were, as far as my knowledge went, unprecedented in myxœdema, but I had no suspicion of any external irritant cause and treated the general cachexia. Apparently marked improvement always followed the use of the remedy.) On April 22nd she had improved; the swelling had diminished and the burning was relieved; the patient had slept for an hour in the morning. There was now some prominence of the mucous membrane of the nose on each side of the septum. The lips were thinner and had little moisture on them and had now a somewhat withered, leathery appearance. The tongue was normal in size, but presenting an oval patch of exfoliation near the point, longest transversely. The soft palate and uvula were now uniformly red. The temperature in the axilla was 98·6°. A dose of extract equal to one-sixth of a lobe was given. On the 23rd the patient was much improved; she had slept well the previous night. The soft palate was as red as ever; the exfoliated patch on the tongue had disappeared. The temperature in the axilla was 98·6°. No extract was given. On the 24th the uvula was still a little swollen; two red oval patches were now seen on the hard palate on each lateral half; the lower eyelids were now somewhat puffy. The temperature in the axilla was 98·5°. No extract was given. On the 25th there was sudden recurrence of irritative symptoms in new situations. The patient stated that the burning in the throat and tongue had returned with considerable severity the previous afternoon for several hours, but did not lead to salivation. On the morning of the 25th at 1 A.M. she was roused suddenly out of sleep by a burning sensation in the face and hands which felt as if they were being "roasted"; this passed off rather suddenly about 3 A.M. At the first glance on my arrival the face was seen to be much broader, with a fulness under the eyes. The pink areas on the cheeks, especially the right, were the seat of a vesicular eruption which was even more marked below the patches where some of the vesicles, seated on a reddened base, were oozing out serum and there was a similar angry rash on the chin. The burning had now given place to an itchy sensation and there was a numb feeling about the hands and in the thumbs more especially. The fingers were swollen and on the back, next the nails (and this was more marked on the thumbs), the skin was quite red for half an inch or so. Irritation had quite gone from the mouth, where all the parts were nearly normal; speech had improved and taste in the mouth was returning. The temperature in the axilla was 98·5°. Ten minims of Brady and Martin's extract of thyroid were now given. On the 26th there was an astonishing change; every trace of eczema or irritation had gone; the face only was a little swollen; the most pronounced remaining sign of myxœdema was the tawny yellow colour. The patient now felt so well and lively that she "could do anything." The temperature in the axilla was 99°. No extract was given. On the 27th the patient was very well; the temperature in the axilla was 98·4°. Five minims of extract were given. On the 28th the temperature in the axilla was 98·8°; the patient was very well, but some redness of the gums was present, especially of the lower. No extract was given. On the 29th the temperature in the axilla was 98·4°; she said that she had not felt so well for some years; she had got

thinner, her thumbs being thrown into wrinkles. The lips, tongue, and uvula were normal. Menstruation ran its usual course in the case and it recalled to my recollection that of a woman who had attended the dispensary of the Glasgow Western Infirmary for some uterine affection and who at one of her visits stated that at her previous menstrual period (as also during the present one which was in actual progress) she had had a sore tongue and throat, and the following note was taken at the time: "Point of tongue red and almost denuded of epithelium; on throat an eruption like scarlet fever." There was nothing about this patient to raise the slightest suspicion of myxœdema, but at that time I did not dream of looking for any connexion with the latter.

The urine in the above case was examined on April 28th after menstruation had ceased and it showed the following characters: it was pale, feebly acid, and of specific gravity 1017; there were no albumin, no sugar, and very little mucin. Much of the saliva, if the excretion from the mouth can be so called, had, contrary to orders, been thrown away, but a few ounces were obtained which presented the following characteristics: it was very turbid, depositing shreddy coagula, but without ever becoming clear above; its specific gravity was from 1010 to 1011, neutral, or faintly alkaline (?); it was very viscid, becoming ropy with alkali; there was little frothing power. The filtrate contained 1·224 per cent. of albumin, some globulin, while mucin could be detected up to dilution with 50 volumes of water. Dr. R. M. Buchanan, pathologist to the Glasgow Western Infirmary, examined it for uric acid by Sir A. Garrod's thread test, but found none. He found that the deposit contained, besides blood colouring matter and débris, numerous nucleated epithelial cells, many of them oval and often coalesced into a mass. It is unnecessary to point out the analogy, or rather identity, of the acute swelling in this case with what has been described as angio-neurotic œdema, occurring especially in neurotic females of a gouty diathesis and in other conditions.

Subsequent history.—The patient continued very well for some time, but the myxœdematous physiognomy again developed, with now subnormal temperature, as tested on several occasions, so that she was put on thyroid treatment. This improved her condition in many respects, but ever and anon, and apparently in spite of the treatment, she suffered from severe dermatitis of the face and hands, although the mouth was never afterwards affected as before. At one time her face was so bad that I sent her to a skin dispensary, where an eminent specialist pronounced the case to be erysipelas and applied something which made her worse instead of better. At length she mentioned her case to a gardener from whom she had just procured some specimens of primula obconica, who at once told her that the plant was the cause of her trouble and that he knew of similar cases, one especially of a titled lady who had suffered severely from the effects. It turned out that my patient had all along been cultivating and frequently handling this plant and she stated that she had occasionally chewed the flowers and swallowed the juice, but could not say whether she had done so shortly before either of the acute attacks here recorded. The noxious plant being now discarded there was no further return of the mischief except on one occasion when from curiosity she held a leaf in contact with her lips for a short time, soon after which they, together with the point of the tongue, swelled up for some hours. The important facts remain to be added that she had handled the plant for one or two years before the first blistering of the lips was experienced, whilst the rest of the family had been unaffected by it, although a sister was as much given to chewing the flowers as the patient herself.

Numerous cases in which this irritant has produced similar, but rarely if ever so severe, effects as those observed in this case have been recorded of late in both medical and lay journals and from these several sources the following facts stand out prominently: (1) that the effects are described as erysipelas, urticaria, but more especially as eczema of the face and hands, sometimes attended with much swelling; (2) that some constitutions are specially susceptible while others enjoy immunity; and (3) that apparently the majority of sufferers have been females, although on the latter point the evidence is not decisive. From all the facts it seems reasonable to conclude that the above case was the product of two factors—an external irritant and an internal predisposing cause. The latter seems to me to be the more important and we naturally look for it in the existence of morbid products in the parts affected. The conflagration which broke out there appears, speaking generally, to have consisted in an oxidation and elimination of these waste materials and hence was essentially curative. Mere contact with the irritant cause does not seem satisfactorily to account either for the parts attacked or the effects produced; and, we may ask, were the latter due to a direct action on the tissues concerned or to the stimulation of a partially incompetent thyroid gland? At all events, we find in this case the general physiognomy of myxœdema developed in a few hours, or rather minutes, and the uvula presenting (when first seen and before it became vascular) the same appearance and causing the same snuffling speech as in chronic myxœdema. The case seems to suggest that some preparation of the primula or other similar plant might be of value for diagnostic or even therapeutic purposes. Indeed, it has been already used with the latter object in view, for Dr. Riehl of the University of Vienna is said to have found that the irritant principle resides in the tiny hairs of the leaf and stalk and to have prepared from them an extract with which he claims to have cured some obstinate cases of skin disease.[3] The hairs had been previously ascertained to be glandular by Dr. Wilson of St. Andrews.[4]

In January of the present year this patient had a febrile attack which lasted a week, during which the temperature rose as high as 99·6°. On recovering she felt in better health than before and it seemed probable that she had not been taking a sufficient quantity of thyroid extract. And now a fact came out which had not been brought to light by all the previous inquiry. At the age of 28 years (corresponding to the time when the dry state of the skin commenced) she experienced a pain in the right side of the neck shortly after an occasion of great grief and this was accompanied by a choking sensation which seemed closely connected with it. This lasted about a year and long afterwards she was conscious of discomfort in the same situation on swallowing anything cold. On being asked to point out the spot she placed the point of her finger directly over the right lobe of the thyroid and careful manipulation now seemed to indicate that here the gland was more or less atrophied, while there was a comparative fulness on the left side, although I must confess that I cannot speak very positively on this matter.

CASE 2.—A very brief notice of this must suffice. An unmarried woman, aged 36 years, had consulted me at intervals for two years or more, complaining of symptoms of failing health, which I treated by tonics, &c., without benefit. It was not until one day in April, 1898, that she presented herself before me with a physiognomy so unmistakeably indicative of myxœdema that I recognised the fundamental cause of her ailments. Besides some swelling there were now present subnormal temperature, impaired memory, difficulty in deglutition, the saliva sometimes even trickling from the mouth, and scanty brown and watery menstrual fluid. The thyroid treatment was promptly followed by the usual success, even the menstrual function being restored to its original state of vigour, this and its previous failure being points of exceptional interest. It was now obvious that this case might have been diagnosed at an earlier date, but at the same time the present cases show that the effects of thyroidal inadequacy or irregularity may be more multifarious than has hitherto been supposed. It was in December, 1898, that an acute attack from which the patient suffered resembling urticaria œdematosa led me to reflect on her still earlier history. In this seizure, which came on two hours after a hot bath, her face suddenly flushed up and the eyelids swelled, and this flush shifted rapidly to other parts, as the arms, the thighs and legs, and the trunk, where it appeared in patches which, however, were never pale in the centre. It was accompanied with a distressing scorching and tingling sensation. It not only shifted to and fro, but sometimes disappeared from the skin altogether, and at these times the patient felt a burning sensation in the epigastrium and abdomen generally, which again was instantly relieved on the reappearance of the eruption. There was also said to be some sore throat. I did not see the patient till the fourth day when the worst symptoms had subsided, but the appearances I may note were as follows: there was no rise of temperature; the skin of the face was dry and shrivelled, with elastic œdema of the eyelids which were waxy-looking; the eruption on the chest was indistinguishable from scarlet

[3] The English Mechanic and Gardener's Chronicle, April and May, 1895.

[4] THE LANCET, Sept. 20th, 1890.

fever. Slight if any desquamation followed. Some days afterwards I found the temperature subnormal, and learning from the patient that she had been previously chilly I told her that she was probably not following out the thyroid treatment with sufficient regularity. Now the patient had been under my own care with severe facial erysipelas four years previously and twice within the same year and once again two years later had had attacks similar to that already mentioned but milder in character. She dated the commencement of her progressive illness from a period about three or four months antecedent to the attack of erysipelas. After exposure to cold she began to suffer from cough, pain in swallowing, and a feeling of suffocation, starting from the midriff and extending over the front of the chest, which rendered inspiration oppresive and difficult. She afterwards complained that I paid little attention to these symptoms; and, indeed, finding them persist without any adequate cause being revealed by auscultation I had come to regard them as hysterical, for I knew that she had a certain alloy of this temperament. On inquiry at a later period it was found that the pain in deglutition was seated over the thyroid in front and that the same spot had been painful on pressure. It should be observed that the patient always spoke of this part as the "throat" which is often used to denote the whole front of the neck. The difficult deglutition which ensued later was referable to two localities, one being the fauces, where it was due to sluggish muscular action, and the second the site of the thyroid. A later symptom worthy of note was a stinging pain in the left iliac region which radiated backwards towards the sacrum and down the inner aspect of the thigh as far as the foot and was apparently of ovarian origin. This came on several months before myxœdema was diagnosed and had become so severe that it was the principal cause of bringing her to me at that time. She also suffered from tremors, vertiginous attacks at night, and felt as if she "were going out of her mind" and becoming incompetent for the duties of life. It is obvious that all these symptoms might be referred to hysteria; if so, the important conclusion seems to follow that hysteria itself in this case was dependent on thyroidal irritation, for all the patient's troubles vanished under thyroid treatment and are apparently only kept at bay by it, for they threaten at once to return whenever it is left off for a short time.

I now incline to the view that thyroidal inadequacy was the predisposing and all-important cause both of the erysipelas and urticarial attacks, for which latter no error in diet or drug or other source of irritation could be discovered. The influence of heredity and constitutional states in these affections is worthy of notice in this connexion and it soon appeared that the former had its share in this case also so far as the myxœdema was observed. No sooner had the patient experienced the benefit of the thyroid treatment than she expressed her conviction that a married sister living in Ardrossan must be the subject of the same disease. On visiting the latter I found it was even so; she was already, at the age of 50 years, in an advanced stage, with great impairment of the mental faculties, besides being nearly deaf and blind. I left her for thyroid treatment under the care of Dr. J. McDonald who lately reported that the swelling had disappeared except over the abdomen and that there was improvement in hearing, physical capacity, and mental powers. I cannot detect any trace of the thyroid in Case 2 and she cannot do without a thyroid tabloid for more than a few days, while Case 1 can sometimes dispense with the remedy for a month. Both are positive in asserting that there never was any swelling in the region of the gland. Nevertheless, do not these cases lend some countenance to the supposition that besides sudden and violent perturbations of thyroidal function there may be such an affection as an acute thyroiditis which may sometimes be the starting-point of atrophy and fibrosis?

Glasgow.

MONTGOMERYSHIRE INFIRMARY.—The annual general meeting of governors was held at Newtown on Feb. 23rd, Mr. R. E. Jones presiding. The board of management reported that the adverse balance had increased during the year from £96 to £214 in consequence of the additional accommodation provided for special cases. The medical staff was re-elected and on the motion of Mr. Harold Palmer, seconded by Mr. J. C. Gittins, Dr. Edward Cureton (Shrewsbury) was appointed an honorary consulting physician of the institution.

INJURY TO THE VAGINA, THE RECTUM, AND THE PELVIS;

SUBSEQUENT NECROSIS OF THE PUBES AND PREVESICAL ABSCESS; OPERATION; RECOVERY.

BY H. BETHAM ROBINSON, M.S. LOND., F.R.C.S. ENG.,

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THE following case merits attention from the unusual sequel of a crushing injury to the pelvis and soft parts.

A girl, aged 10 years, was admitted into St. Thomas's Hospital under my care on August 10th, 1895. When crossing the road on that day she was knocked down by an omnibus, the front wheel passing over her lower abdomen. On admission she complained of intense pain above the pelvis and there was considerable bleeding from the vagina. On examination under ether it was discovered on separating the labia that the mucous membrane of the vagina had retracted upwards, being completely torn away round its orifice but behind the hymen below: the wound here was complicated by a rent in the recto-vaginal septum. Owing to the retraction of the vagina there was distortion of the urethra but apparently there was no wound in it. There was no evidence of any fracture of the pelvis in the way of abnormal mobility and there was no blood in the urine when drawn off with a catheter.

The retracted vagina was brought down and its margins were stitched with silk, as far as possible in their original site; thus the orifice of the urethra was replaced in its natural position. At the lower part where the rectum was rent this was sewn up but the wound was only small.

The notes of the case for August 12th state that since the accident the patient had had retention of urine, and that the urine had to be drawn off by catheter, some difficulty presenting, however, owing to the swelling of the parts. The wound on that date looked very sloughy, but there was no tension. The temperature varied between 100° and 101·8° F. The patient was put into a boric lotion bath. On the 14th the temperature still ranged from 100° to 101·8° The urine was now passed naturally into the bath without pain. The wound was cleaner. On the 15th there was a reduction of the temperature to below 100°: there were fæces in the vaginal wound. On the 19th the patient was making satisfactory progress. There was still a small quantity of fæces in the vagina. The temperature was about the normal line. The wound was much cleaner and was granulating. A number of bruises over the left hip were apparent. On the 31st the bath was discontinued as the wound was now cleaner and was granulating nicely. No fæces passed into the vagina and there was only a little discharge from the vagina. There was no pain. The general condition of the patient was very good. She left the hospital on Sept. 11th with the wound entirely healed; both urination and defecation were performed without any hindrance.

On April 20th, 1898, the patient was again brought up to the hospital complaining of having experienced severe pain for the past three days in the lower abdomen which was swollen, and there was some difficulty in micturition. The temperature was 102·8° and the child looked decidedly ill. On examination on the 21st there was a hard, rounded swelling on the left side of the mid-line below the umbilicus and per rectum this was felt to be nodulated and elastic, evidently containing fluid and reaching down to the level of the bottom of Douglas's pouch. The genitals gave evidence of the old injury. The lower part of the vestibule was a contracted fibrous ring into which the little finger would not go; the urethral orifice was within this and after some difficulty a small catheter was passed into the bladder, drawing off urine but without influencing the size of the swelling although it did not seem quite so prominent. As the instrument went in it was felt to pass over, as it were, tough fibrous ridges transversely placed on the upper wall about the neck of the bladder. In the vagina a sequestrum about three-quarters of an inch long was discovered and it was removed; it was a portion of the descending ramus of the pubes.

As the swelling seemed probably an abscess in front and to the left side of the bladder, a sequel of her previous accident, an operation was at once proceeded with, the

patient's temperature at the time being 100·6°. An incision was made on the left side starting just above the pubes and at the outer margin of the rectus and passing along the line of the inner half of the inguinal canal. On dividing the external oblique the round ligament was exposed and it was seen to be imbedded in inflammatory infiltration. On cutting carefully through this matted tissue just above the ligament into the floor of the canal a cavity was opened of about the size of an orange from which very fœtid pus escaped with three small sequestra. The cavity had rather thick, well-defined walls and its floor was over and included the upper part of the left pubic arch and lay above and to the left side of the urethra as proved by the passage of the catheter. In the bone were some small pits from which the sequestra had come. The space was washed out with boric lotion and a drainage-tube was put in. It was dressed with cyanide gauze. The purulent collection was situated in the pre-vesical space (cavum Retzli) above the superior layer of the triangular ligament and to the left side of the urethra and had formed in relation with the necrosis of the arch secondary to the injury. The sequestrum found in the vagina had exfoliated from the pubes below the inferior layer of the ligament and thus the attachment of both layers of the ligament separated the sites of the necrosing fragments and accounted for the non-communication of the vagina with the abscess cavity.

The after progress of the case was uneventful. The temperature immediately dropped to normal and there was no further interference with micturition. The drainage-tube was removed on April 29th and the child went out with the wound healed on May 4th.

The first point to comment upon is that at the time of the injury, although it was strongly suspected, there was no evidence of any fracture of the pubic arch. In the light of what happened it is highly probable that there was a fissure with some splitting of bone which slowly exfoliated. This necrosis was attended by the formation of the very localised tumour in the front of the bladder. It was curious how the superior layer of the triangular ligament separated the two necrosed fragments and completely shut in the pus collection below.

Upper Wimpole-street, W.

VANISHING TUMOURS.[1]

BY D'ARCY POWER, F.R.C.S. ENG.,

SURGEON TO THE VICTORIA HOSPITAL FOR CHILDREN, CHELSEA; ASSISTANT SURGEON AND TEACHER OF SURGERY AT ST. BARTHOLOMEW'S HOSPITAL.

I WISH to deal in this paper with a phenomenon which has not yet, I think, received adequate attention though it must have been repeatedly observed by nearly every surgeon. The phenomenon to which I refer is the disappearance of a tumour which sometimes takes place after such slight surgical operations as incision, puncture, or even simple exposure. For the sake of convenience I venture to speak of these swellings as "vanishing tumours," for this character of spontaneous disappearance is really very startling and though it is satisfactory to the patient it is somewhat disconcerting to the medical practitioner for it nearly always falsifies his prognosis.

I would say at the outset that a "vanishing tumour" is not to be confused in any way with a phantom tumour, for it is in every respect a true swelling, visible to the eye, apparent to the touch, and capable of exposure by the ordinary surgical methods; occurring at any age and in either sex; most often innocent but sometimes, as I hope to show, undoubtedly malignant. My attention was first called to this form of tumour by the following case.

CASE 1.—A boy, aged eight years, was brought to me a few years ago suffering from a large cystic lymphangioma which occupied the whole of the left side of the neck, reaching upwards behind the pinna of the ear, the lobule of which it had invaded, and extending across the middle line in front of the neck. The swelling had been noticed directly after birth and it had been tapped before I saw it about 150 times with a trocar and cannula. It had not undergone much change in size and though it did not increase proportionately to the growth of the boy it got no smaller. The tumour consisted of an elastic and slightly lobulated tissue to which the skin was closely adherent. It clearly contained many cysts varying greatly in size and tenderness. With a full appreciation of the difficulties to be encountered I advised that the tumour should be removed and in due course I extirpated as much of it as lay in the posterior triangle of the neck. The wound healed by first intention and without any trouble except for a sharp attack of lymphangitis about a fortnight after the operation, due to a long railway journey home in frosty weather.

I saw the boy two months after the operation and found that the posterior triangle was free from growth but that the tumour still extended obliquely from the lobe of the ear which it involved, tilting it upwards across the neck to the second or third ring of the trachea on the right side. The swelling was greater at the lower than at the upper part of the neck. Five months after the operation the boy had a second attack of lymphangitis in the tumour and in the following month he had a third attack. After each attack the swelling seemed smaller. He was brought to me again nine months after the operation with the information that the tumour had vanished. I examined the neck carefully and found that the left anterior triangle was so soft that the beating of the carotid artery could be clearly felt and there was no trace whatever of the former swelling. I have seen the boy several times since, but there is no return of the tumour and the two sides of the neck are now quite symmetrical.

Microscopical examination of the piece of tumour removed showed that it consisted of a number of cysts formed of dilated lymphatics. The cysts had no very definite walls and irregular tags of connective tissue projected into them in many places. I should not have been at all surprised therefore if the tumour had consolidated into a mass of fibrous tissue or if the many small cysts had fused into a single large one. But I was distinctly taken aback, though the sensation was a pleasurable one, to find that the swelling, which was of very considerable size and extremely unsightly, had vanished so completely as to leave healthy and supple skin without any underlying induration.

CASE 2.—This case is an equally remarkable one and does not seem to be easily capable of an explanation. A girl, aged one year and ten months, was admitted into the Victoria Hospital for Children at Chelsea under the care of my colleague, Dr. J. W. Carr, on Nov. 1st, 1898. She had been ailing for six months, suffering at first from whooping-cough and afterwards from bronchitis and diarrhœa. During the week before her admission to the hospital she had been getting worse, being feverish, sick, and passing dark-coloured and slimy motions which contained blood, whilst for the last day or two her mother had noticed that she had been getting yellow. The other children were healthy and there was no history of syphilis to be obtained, but a brother and a sister of her mother—i.e., an uncle and an aunt of the patient—are patients in the Brompton Hospital for Consumption. The ward-note states that on admission the child was fairly well nourished, with a pale-yellow complexion and yellow conjunctivæ, the skin of the body generally being rather pale. The liver was enlarged and a little tender and its edge could be felt about an inch below the costal margin. All the other organs appeared to be healthy. The temperature was 102·2° F. Four days later the jaundice was deeper, the abdomen was distended, and the liver was rather larger, for it now reached about one and a half inches below the costal border of the ribs, the upper limit of the liver dulness being on a level with the sixth rib. After an interval of another four days a note was again made that the liver was considerably larger, for its lower border could be felt just above the level of the umbilicus, the upper limit being, as before, in the sixth space. The stools were almost white, but they were less offensive than they had been. Three days later, on Nov. 11th, the liver was said to be still larger, and it was undoubtedly tender when pressure was made over it. The upper limit was the sixth rib, the lower border was on a level with the umbilicus or a little below it. The stools were formed and were of the colour of white clay. The temperature was becoming hectic, oscillating between 102° and normal. On Nov. 15th, and again on Nov. 18th, the notes repeat the statement that the liver maintained its large size and that the jaundice was still present. The child was handed over for surgical treatment on Nov. 22nd in the

[1] A paper read before Harveian Society of London on March 2nd, 1899.

hope that an exploration of the liver might afford her some relief and on the same day I opened the abdomen in the upper part of the right semilunar line. The liver was much congested but its surface was perfectly smooth and free from any adhesions. I passed a trocar and cannula deeply into its substance in three different directions as I thought it possible that there might be an hepatic abscess, but blood alone issued from the punctures. The lower border of the liver was then examined and a cystic swelling was felt which at first I took to be the gall-bladder, for the liver tissue was firmly adherent to it and was so thin that a part of the cyst projected through it at some distance away from the edge. A closer examination showed that the apparent cyst was in reality part of the small intestine which was so densely adherent to the liver that it was not thought advisable to separate them. The abdomen was closed and the child was said to have suffered very little from shock, the pulse being almost, if not quite, as good at the end as it was at the beginning of the operation. The temperature fell to 96·2° in the night and though it rose on the following day it was never more than 100° during the rest of the patient's stay in the hospital. The abdominal wound was quite healed on Dec. 2nd and it was noted on that day that the liver was not quite so large though it was still very tender. On Dec. 9th the liver reached about one and a half inches below the costal margin, extending well over to the left of the middle line, but the tenderness had disappeared. On the 13th the liver was still smaller and on the 30th its lower border could no longer be felt beneath the ribs. The patient was allowed to get up and was walking a little by herself on Jan. 17th, 1899, and on the 24th as the liver appeared to be of its natural size and the abdomen was quite soft she was discharged from the hospital.

If it had not been for the remarkable and continued defervescence which followed the abdominal section in this case I believe that I should have regarded the shrinking of the liver as a simple coincidence, and that by accident I had done the operation at a time when the hepatitis had reached its maximum, but the range of the hectic fever had been so uniform and its cessation was so complete that I feel sure that the improvement was due directly to the operation.

I have had an opportunity lately of studying another vanishing tumour which was in St. Bartholomew's Hospital under the care of my chief, Mr. W. J. Walsham.

CASE 3.—A man, aged 21 years, was admitted into Harley ward with a tumour situated between the umbilicus and the pubes and apparently fixed to the pubes. It was three or four inches broad and of about the size of a large cocoanut. The swelling could be felt per rectum as a rounded mass moveable by the finger. The patient had been losing flesh lately, but his temperature was normal, his bowels acted naturally, there was no blood in his motions, and no pain on defecation: nor was there anything abnormal discovered in his urine or in the act of micturition. An incision was carried into the abdomen through the linea alba, when the tumour was found to be so fixed to the pelvis as to render its removal impossible. It was covered with large tortuous veins and was of a dark-red colour with the consistence of a soft solid. The wound was closed and united by first intention, the patient making an uneventful recovery. He was discharged with the swelling apparently in the same condition as upon his admission to the hospital or perhaps a little larger. Three months later he came back to the hospital and it was then found that the tumour had entirely vanished and that the patient had gained a stone and a half in weight.

Mr. Walsham in commenting upon this case[2] says very appositely that "it is of great interest as bearing upon the question of the occasional spontaneous disappearance of sarcomatous growths. It is, of course, possible that we were mistaken in our diagnosis and that the tumour was not sarcomatous. Its rapid growth, firm connexion with the pelvic bones, progressive loss of weight and strength of the patient, taken with the appearance and consistency of the swelling itself as revealed at the exploratory operation, led me to entertain no doubt as to its nature, and those of my colleagues who saw it with me were of the same opinion. This is the second case which I have personally met with of a supposed sarcoma in the abdomen disappearing spontaneously and several of my colleagues, I know, have had a similar experience. It may be added that there was no discharge of pus from the rectum, bladder, &c., nor any other sign of its having been an abscess or of an inflammatory nature; but of course one cannot lose sight of the possibility that it might have been an inflammatory or some other affection of the glands."

Mr. Walsham alludes to other cases of a similar character having been seen at St. Bartholomew's Hospital and I find the following in the Statistical Tables for the year 1897[3] as having occurred under the care of Mr. Alfred Willett who has kindly given me leave to publish details of the case on condition that I say that the patient was also seen by Mr. Bowlby.

CASE 4.—A man, aged 54 years, was admitted on account of an abdominal tumour and vomiting, both of two months' duration. He had also been losing flesh and was constipated. A hard nodular mass as big as a man's fist could be felt in his abdomen, lying just below the liver and slightly to the right of the middle line. It was well defined and was not particularly tender. An exploratory incision showed that the growth was adherent to the external abdominal wall in front, to the stomach and duodenum behind, and to the under surface of the liver above. The gall-bladder seemed to be quite surrounded by the new growth, which thus proved irremoveable and was thought to be malignant. The patient recovered rapidly from the operation and he left the hospital three weeks afterwards. He reported himself three months later to say that since the operation the swelling had "much dispersed." Four months afterwards he again came to the hospital and was examined at "consultations" by many of the surgeons, who agreed unanimously that no tumour could any longer be felt in his abdomen, and at this time the man seemed to be in good health. But a few months later he was seen by Mr. Berry, the surgical registrar, in another hospital, suffering from jaundice and emaciation and there was but little doubt that he had malignant disease probably in or near the head of his pancreas, a diagnosis which was confirmed after the death of the patient. Mr. Berry, to whom I wrote for further details of this patient, has kindly given me the following account of another case of a like nature.

CASE 5.—"A man was admitted into the Royal Free Hospital under Dr. Sainsbury and was seen by Mr. Boyce Barrow and myself. He had a rounded and hard lump as big as a fist in the region of his pylorus. We all thought it was malignant, although from its smoothness and some other features I never felt sure that it was not inflammatory. I opened the abdomen and found some adhesions which I broke down. The man made an excellent recovery and lost all his symptoms of pyloric obstruction. Nothing more was seen or heard of the lump after the operation."

CASE 6.—The vanishing tumours to which I have referred hitherto have been innocent growths but this wax model and these drawings from the museum of St. Bartholomew's Hospital[4] belong to another category. They represent the top of the head and show a large flattened, irregularly-lobed tumour of the scalp lying over the interparietal suture. An area devoid of hair and measuring two inches in width by six inches in length, extending over the left parietal and frontal regions, marks the position of a former tumour which was removed by operation. Two flattened swellings are now seen near the scar and a third lies over the left frontal region. The patient was a man aged 24 years who at the time of his admission to the hospital in March, 1890, gave the following history. About six years previously he received a blow on the top of his head from the flywheel of an engine. He took no notice of the injury at the time but a tumour began to grow a few months later at the place where he had been hurt. It reached the size of a sparrow's egg and then disappeared in about six months. Six or eight tumours subsequently appeared on different parts of the head and then diminished in size. Another tumour appeared in September, 1889, and grew steadily but quite painlessly until it was removed in March, 1890, when it measured 10 inches in circumference. The scar caused by the removal of this tumour is seen in the model to lie over the left parietal bone. Microscopical examination showed the tumour to be a fibro-sarcoma, for it consisted for the most part of a round-celled sarcoma interspersed here and there with irregular connective tissue cells and in places with bands of fibrous tissue. The patient was under the care of Mr. Morrant Baker who applied the appropriate term

[2] St. Bartholomew's Hospital Reports, vol. xxxiv., 1898, p. 275.

[3] St. Bartholomew's Hospital Reports, vol. xxxiv., 1898, p. 239

[4] Series 56, No. 212B, and Series 57, No. 1232 and No. 1232A.

"withering sarcoma" to this rare specimen which is the more interesting because it was a well-known axiom with Cohnheim that "in the life-history of tumours there is only one fact of universal application—that a new growth never spontaneously recedes and disappears." Here, however, is a new growth which actually did recede and part of it disappeared, so that his generalisation is incorrect. And if it is incorrect for sarcomata there is no reason why it should not prove to be equally inaccurate for carcinomata. Indeed, there is very little doubt that carcinomatous ulcers of considerable size have been known to heal sometimes only superficially, the cancerous process continuing beneath the scar, but in some few cases the repair has been complete and permanent. Instances of atrophying scirrhus, too, are not uncommon in old and spare people, nor is the process difficult to explain in those whose tissues are undergoing nothing but retrogressive changes, since the cells have almost lost their power of reproduction.

There remains yet another class of vanishing tumours, but I am not concerned to speak of it at any length this evening, though it forms in some respects a pendent group to those which I have just mentioned. I mean cancers which disappear, or at any rate cease to show signs of active growth, after the removal of an ovary—hypertrophied prostates which become smaller when a testicle has been cut out or when the vas deferens has been divided and adenomata of the breast which vanish as a result of pregnancy and lactation. In these cases we shall have to look much further for the cause of the disappearance, because such tumours vanish as a result of a series of complex physiological changes about which we know nothing at present.

Mr. Stanley Boyd has recently called renewed attention to this class of tumour in his interesting and suggestive "Remarks on Oöphorectomy in the Treatment of Cancer of the Breast,"[5] and a similar case, brief notes of which follow, was under my care, conjointly with Dr. W. S. A. Griffith, last summer.

CASE 7.—The patient was in a state of advanced cancerous cachexia with a mass of scirrhus in one breast and symptoms of serious ovarian disease. On opening the abdomen both ovaries were found to be enlarged and cystic and the small intestine as it appeared in the wound was plainly the seat of metastatic deposits of cancer. One ovary and the breast were removed but no attempt was made to complete the operation by opening the axilla as the patient seemed to be too ill to bear any prolonged surgical manipulation. But she made a speedy recovery and she increased rapidly in weight.

I fully believe with Mr. Stanley Boyd that the removal of the ovary in this case was the direct cause of the retrogressive changes in the cancer. There must, however, be some physiological connexion between the two organs before such an effect can be produced, for I am not inclined to remove the testes for the cure of a cancer of the lip as a facetious and sceptical friend lately pointed out would be the proper and logical outcome of the hypothesis.

Many similar cases might easily be collected, but these are enough for the purpose which I have in view—viz., to draw attention to a class of tumours which either vanish spontaneously or after such comparatively slight surgical treatment as partial removal or exploratory incision. Many interesting points for discussion arise in connection with these tumours. Occasionally they are true sarcomata or carcinomata but they are much more frequently inflammatory swellings of the connective tissue and they occur, therefore, where the connective tissue is abundant in quantity and loose in texture. They are formed slowly and painlessly and they disappear in like manner. Yet being of considerable size and consisting of cells which are multiplying actively they may cause pressure symptoms and constitutional disturbances which make it hard to distinguish an innocent from a malignant tumour.

Now, the first point which I wish to raise is, What would have become of these tumours if they had been left alone? And it is to seek an answer to this question that has led me to bring this paper before the Harveian Society of London this evening for I think that many of the members may have seen such swellings and may perhaps have been somewhat more inclined to allow them to run their course unmodified by surgical interference. In the case of the lymphatic tumour (Case 1) I think that in all probability it might have remained another eight or 10 years, eventually shrivelling to become a wen or a soft fibroma. It might even have disappeared altogether and those who attended the last clinical meeting of this society will remember a very interesting case shown by your secretary, Mr. Raymond Johnson,[6] of a child with a cystic lymphangioma in the neck very similar to the one which I have described. No operative measures had been adopted, except puncture of the largest cyst, but the tumour was shrinking spontaneously in more than one direction. It was therefore getting steadily smaller and where it had shrunk the skin seemed to be perfectly healthy, whilst the underlying tissues were free from any induration. But the process of disappearance is a very slow one and the tumour in these cases is so unsightly as to make it quite worth the while of a child occupying a good social position to run the risk of extirpation, for no boy with such an hygroma could lead a happy life at a public school. Besides, one has no right at present to assume that they will disappear completely, for though the cysts may vanish I have seen thickened, warty, and ugly scars remain. But vanishing cysts are not confined to children; they occur sometimes in the breasts of women, and Mr. Bryant gives details of two cases which occurred in his own practice.[7]

The enlarged liver in Case 2 would, I think, have suppurated most undoubtedly. The inflammation was probably tuberculous and the *rationale* of cure was the same as in those cases of serous peritonitis which recover after simple incision and evacuation of the fluid. I do not know what would have become of the abdominal swellings. If no operation had been done they might still have disappeared or each might have formed an abscess. The connective tissue cells of the part were clearly in a very unstable condition and it is easy to imagine that under suitable conditions a sarcoma might have been produced. At any rate it is of the highest importance to know that such chronic and seemingly causeless inflammations can occur in the body. Presumably they may begin in gland or in epithelium equally with the connective tissue and if this be so and the infection of cancer with a predisposition to it happen to be in the body such an inflammation may be the determining cause of its local manifestation. Indeed, in Mr. Willett's case (Case 4) a patient with such a vanishing tumour actually died from cancer growing in the neighbourhood of his pancreas, where he had already suffered from an inflammatory swelling which had disappeared after his abdomen had been opened to find out its nature. The effect of surgical interference upon these tumours seems to be identical with that which takes place when any inflammatory swelling is incised. Tension is relieved and a series of complicated physiological changes are set up which end in resolution. We are ignorant as yet of the nature of these changes, but we assume them to be the direct outcome of alterations in the vaso-motor and trophic functions. The older surgeons set these changes in action by bleeding, for in this way they obtained a local effect by modifying the whole blood-pressure and it is certain that phlebotomy cured many obscure swellings. Blood-letting fell into disuse, but time, bringing with it improved surgical methods, has led us to cure by adopting similar means. Instead of drawing blood from the arm we now attack the part affected, even though it be placed where the most enlightened or reckless of our surgical forefathers would have considered it criminal to explore.

It is comparatively easy to understand how a simple inflammatory swelling may disappear, but it is very difficult to realise, much more to explain, the vanishing of a malignant tumour. Yet there can be little doubt that sarcomata, and in some very rare cases even carcinomata, do actually disappear. In a cancer such a disappearance seems to me to be quite inconceivable, unless we assume the disease to be one of an infective character in which the result as measured by the growth is in direct proportion to the amount of poison absorbed or manufactured within a body which is more or less predisposed to its action.

In speaking of these vanishing tumours I have mentioned in each case that they have been only partially removed or that they have only been looked at and not removed at all. I would not have it understood from this that I countenance or in any way recommend the partial removal of a tumour or that I think it is a desirable proceeding. Modern surgery, based as it is upon pathology, teaches most emphatically that tumours should be

[5] Brit. Med. Jour., vol. i., 1899, p. 257.

[6] THE LANCET, Feb. 11th, 1899.

[7] Transactions of the Medical Society, vol. xix.

removed as completely and as early as possible and that the more a swelling is considered to be malignant the earlier and more complete should be the removal. But it has happened in these cases that from one cause or another so complete a removal was impossible, yet by accident or good luck coupled with some unusual modification of the morbid process the results obtained were most satisfactory though the method adopted was in the highest degree unsatisfactory if we look to the means rather than to the end.

Chandos-street, Cavendish-square, W.

ACTINOMYCOSIS (?) OF THE OMENTUM; DEATH FROM PYÆMIA.

BY HENRY HANDFORD, M.D. EDIN.,
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THE interest of the following case does not depend solely upon the diagnosis. Whether actinomycosis or not the distribution and course of the disease are uncommon and the mass of new tissue is something quite unusual except in malignant disease which this certainly was not. I know of no other disease except carcinoma (scirrhus) in which such remarkable hardness of the new tissue is found. All the more common causes of inflammation and suppuration in that region were excluded at the post-mortem examination; but, indeed, none of them usually produce the amount of new tissue found in this case. The patient from his occupation had to do with corn and it is probable that he swallowed some to which the fungus was attached and that so the omentum was reached from the transverse colon. The general *coup d'œil* bore a striking resemblance to other cases which have occurred in this neighbourhood, but as the actinomyces was not found the diagnosis must remain non-proven.

The patient was a robust gamekeeper. At the end of August, 1898, he was suddenly seized with violent abdominal pain which lasted three days and did not return. He remained in bed a week. For the previous five weeks he had been going about, but had been unable to work. He was admitted into the General Hospital, Nottingham, on Oct. 4th complaining of loss of strength and weight. He then weighed 11 st. 4 lb., whereas six weeks previously he weighed 15 st. 3 lb. He had had severe diarrhœa which on admission had ceased. The most marked feature during the past fortnight had been repeated rigors during which his temperature ran up to 103° F. It was supposed that he might have some internal abscess and he was sent into the hospital for careful examination and watching. A most diligent search was made for any signs of suppuration in connexion with the appendix or with an impacted gall-stone but without success. At this time there was no pain or tenderness and the abdomen, which was large, could be palpated with the greatest freedom without revealing anything abnormal. The temperature was always febrile. For about a month he improved, regained a little weight, and got up. On Nov. 6th for the first time he was slightly jaundiced and the urine contained bile. It was gone in 24 hours and never returned to any great extent though he was a little yellow at the last. He now gradually began to complain of pain in the epigastrium. The abdominal muscles were held rather more rigid than formerly, but no growth could be detected. He was seen repeatedly by my surgical colleague, Mr. A. R. Anderson, both before and after his admission to the hospital, but no accurate diagnosis could be arrived at and there appeared no opportunity of successful surgical interference. By Nov. 24th the patient had become much worse, and as he was anxious that something should be done it was explained to him that his condition was desperate but that the abdomen could be opened to search for an abscess. If one was found the opening of it might relieve him. An exploratory laparotomy was performed by Mr. Anderson. It was shown that there were no gall-stones and no abscess in the superficial parts, but the tissues were so matted together that a full exploration was not possible, especially as the bleeding was free. The patient died on the next day and the examination post mortem showed his condition to have been quite irremediable either by medicine or surgery.

At the necropsy the intestines were found to be extensively adherent. The mesentery was somewhat thickened. The main mischief was in the transverse meso-colon which was of wooden hardness and from one to two inches thick. It was of normal colour and looked like ordinary dense fibrous tissue. There was general interstitial suppuration, scores of small abscesses, varying in size from that of a No. 1. shot to that of a pea, being found. There was a larger abscess nearer the head of the pancreas containing about two ounces of thick greenish pus. The pancreas, though enveloped in this new tissue, was itself healthy as shown by microscopic examination as well as by the naked-eye appearance. Behind the stomach was an abscess containing about three ounces of thick pus, which communicated with the stomach by a minute recent perforation. From the extensive ulceration and sloughing upon the outer (peritoneal) surface of the stomach and the uninjured condition of the mucous membrane around the perforation it was quite evident that the perforation had taken place in the unusual direction from without inwards. The microscopic examination also states: "The sections of the wall of the stomach show suppuration outside the muscular coat; perforation has probably taken place from without inwards." Behind the transverse meso-colon as well as behind the gastro-hepatic omentum several smaller abscesses were found. The liver was slightly enlarged and contained several pyæmic abscesses. There was also suppurating pylephlebitis. The gall-bladder contained normal bile. There was no stone in the gall-bladder or in any of the ducts. The portal fissure was occupied by a hard mass of similar colour and appearance to the rest of the new tissue and about two inches in diameter. The pressure of this no doubt caused the jaundice observed during the latter part of his illness. The other organs, including the intestines, were normal.

The origin of the disease appears to have been in the neighbourhood of the transverse colon which was completely hidden and embedded in the suppurating omental tissue. There was no malignant growth of the bowel itself. The true great omentum below the transverse colon was only thickened for two or three inches below the bowel. The great mass of new tissue was between the transverse colon and the pancreas and between the stomach and the liver. To the naked eye the new tissue bore the strongest resemblance to actinomycosis in its colour, its consistence in inflammatory fibrous tissue, its extreme hardness almost resembling wood, and in the interstitial suppuration. The characteristic granules were not found but the search for them was not prolonged as the examination had to be made late at night.

The microscopic examination showed no evidence of inflammation or malignant disease in the pancreas. The lesion in the omentum and transverse meso-colon was entirely inflammatory and there was nothing to show the cause of the suppuration. The tissue was chiefly fibrous. It bore no resemblance to carcinoma. Many sections were stained for actinomycosis but none was found. This is not very remarkable considering how troublesome the clubs are to stain in human actinomycosis and how sparsely scattered the fungus may be.

Nottingham.

ROYAL FREE HOSPITAL.—The seventy-first annual meeting of subscribers, governors, and others interested in this hospital was held at the hospital in Gray's-inn-road on Feb. 22nd, the Hon. Mr. Justice Bruce, chairman of the committee, presiding. Among those present were Captain Jessel, M.P., Mr. Charles Burt, Dr. Samuel West, Mr. James Berry, Dr. Elizabeth Blackwell, and Mrs. Garrett Anderson, M.D. Paris. In moving the adoption of the report the chairman said that the committee considered that the time had come when a commencement should be made in carrying out the urgently needed building improvements referred to in the report—viz.: (1) the alterations and additions to the ward lavatories, sculleries, and bathrooms; and (2) better accommodation for the nursing staff. With regard to the latter it was proposed to build a fourth storey over the side portions of the central block, which would provide separate bedrooms for 27 sisters and senior nurses, an enlarged sitting-room, additional bathrooms, &c. The estimated total cost of these works is £8500, towards which the sum of £2870 is available.—Before the close of the meeting the Earl of Stamford was appointed to fill the vacancy of Vice-President caused by the death of the Earl of Lathom.

A Mirror
OF
HOSPITAL PRACTICE,
BRITISH AND FOREIGN.

Nulla autem est alia pro certo noscendi via, nisi quamplurimas et morborum et dissectionum historias, tum aliorum tum proprias collectas habere, et inter se comparare.—MORGAGNI *De Sed. et Caus. Morb.*, lib. iv. Proœmium.

UNIVERSITY COLLEGE HOSPITAL.

A CASE OF OPHTHALMIC HERPES WITH HYPOPYON-KERATITIS.

(Under the care of Mr. PERCY FLEMMING.)

A MAN, aged 54 years, went to the casualty department of University College Hospital on Nov. 16th, 1898, on account of a burn of the head received in a gas explosion. He was treated by the house surgeon and 14 days later he was sent to the eye department as the eye had become inflamed. When Mr. Flemming first saw the patient on Nov. 30th his head was enveloped in bandages down to, and including, the eyebrows. The right eye showed much conjunctival redness with a little muco-purulent discharge. At the lower and inner part of the cornea was a small ulcer with a distinctly infiltrated edge; the anterior chamber was deep, the aqueous humour was turbid, and the iris was rather muddy. There was no hypopyon and nothing abnormal was found in the lacrymal sac. The bandages were not removed from the head and it was considered that the case was one of infective ulcer of the cornea due to the burn in the first place and to the state of the conjunctiva in the second. The patient was admitted into the general ward, the conjunctival sac was thoroughly irrigated with warm boric acid lotion, the lids were painted with nitrate of silver solution (10 grains to the ounce), and atropine drops and a quinine mixture were prescribed. The eye was not bound up. Two days later the ulcer had spread both superficially and deeply and there was a small hypopyon. On Dec. 3rd the lids were again painted and the ulcer itself was touched with pure carbolic acid; it was noticed that the patient seemed to feel very little pain when this was done. On the 5th the note states that the ulcer was cleaner but possessed still a well-marked infiltrated edge. A quinine lotion was ordered and the eye was bandaged. By the 8th the hypopyon had increased considerably and the ulcer had spread still further. There was still a good deal of conjunctival secretion and the lids were again painted with nitrate of silver and the eye was again bandaged. On the 10th Mr. Flemming for the first time saw the head dressed and it was then evident that in addition to the injury the patient was suffering from an attack of ophthalmic herpes. The right half of the forehead was red, the redness extending into the scalp, but being sharply limited by the middle line; there were several recent scars over this red area. Inquiry now elicited the fact that the patient had had much neuralgic pain over the right side of his head for some days previously to the accident, on account of which he first went to the hospital. Sensation was diminished but not abolished over the right side of the forehead and on the right eyeball. As soon as the "trophic" nature of the case was recognised the nitrate of silver was discontinued and the eye was kept firmly bandaged with a pad soaked in quinine lotion, but matters did not improve and four days later the ulcer had spread still more and the anterior chamber was quite one-third full of pus. On the 15th Mr. Flemming sutured the lids together, previously paring their edges for about the middle two-fourths of their extent. Union did not take place. This was partly due to the fact that the patient, to use his own expression, "worked the eye well about" under the bandage. On the 20th, therefore, the lids were re-sutured and the stitches were removed four days later, good union resulting. The patient left the hospital on Jan. 4th, 1899. At this time it was quite possible to examine the surface of the cornea by making the patient look well to the right or left, the lids being separated at the inner and outer canthi. The ulcer had quite healed and no hypopyon could be detected. By the 7th the adhesions had stretched a little and it was possible to make a more thorough examination. There was no trace of hypopyon and the surface of the cornea was smooth. The pad and bandage were discontinued on the 23rd and the patient returned to work early in February still having the lids united.

Remarks by Mr. FLEMMING.—The interest and value of this case consist, I think, in the evidence which it affords respecting the efficiency of suturing the lids in cases of neuropathic keratitis. Looked at from this point of view it may almost be regarded as a crucial experiment. When the eye was first examined the nature of the case was overlooked, the dressing and bandages applied by the house surgeon concealing the skin eruption. When it was discovered that the patient was suffering from ophthalmic herpes the keratitis had spread and there was an extensive hypopyon, and I confess to having had some misgiving when I decided to suture the lids and tie the eye up. But under this treatment the inflammation promptly subsided and the hypopyon disappeared. To guard against a relapse the lids will be kept united a few weeks longer. On the other hand, the failure of treatment conducted on the ordinary lines for infective ulcers is equally striking. Further, the inefficiency of simple bandaging in these cases is shown, for the eye was treated in this way a few days after admission. Protection by pad and bandage is not effectual in keeping out particles of dust and fluff. I discussed the pathology of these cases in a paper published in THE LANCET of July 2nd, 1898, and the occurrence of pain and iritis with a deep anterior chamber in this case lends some support to the views there expressed. If, as some suppose, these cases of neuropathic keratitis are merely examples of bacterial invasion of tissues, made prone to such invasion by being deprived of their nerve-supply, one would hardly expect healing to occur when the lids are sutured, the conjunctiva being inflamed at the time. In the paper previously mentioned the suggestion was made that the perverted nerve action resulted in an increase and alteration of the fluid secreted by the ciliary body, and in a similar way may perhaps be explained the conjunctivitis in this case. Suturing the lids seems the most efficient way of protecting the eye and the cornea is at the same time kept warm and moist and the healing process is thereby greatly favoured. This case further illustrates the fact that cases of ophthalmic herpes are apt to be overlooked and mistaken for other conditions. But attention to the unilateral character of the herpetic eruption should prevent mistakes being made. Probably the errors in diagnosis arise from ignorance of the existence of such a disease as "shingles of the brow" and this is one reason for publishing this case.

HUDDERSFIELD INFIRMARY.

TWO CASES OF ABDOMINAL SECTION IN WHICH UNUSUAL PATHOLOGICAL CONDITIONS WERE MET WITH.

(Under the care of Mr. S. KNAGGS and Dr. E. A. WRIGHT.)

THE existence in the first case recorded below of an irreducible inguinal swelling and the history of a hernia fully justified the diagnosis of a strangulated hernia when signs of intestinal obstruction appeared; and indeed the diagnosis of suppurative peritonitis is not rarely a matter of great difficulty, for even when the abdominal cavity contains a large quantity of pus distinctive signs of peritoneal inflammation may be conspicuously absent. In the second case the puckering of the intestine appears to have been the cause of the intestinal obstruction and Dr. Boyd's explanation of the mode of its occurrence is probably correct. Both cases are of much interest and are well deserving of publication. For the notes of the cases we are indebted to Dr. Robert Boyd, senior house surgeon.

CASE 1. *Perforative appendicitis simulating a strangulated hernia in a patient the subject of congenital hernia.*—A well-developed youth, aged 19 years, was admitted into the Huddersfield Infirmary on Oct. 11th, 1898, under the care of Mr. S. Knaggs. The patient previously to Oct. 6th enjoyed good health but he had had from infancy a congenital left inguinal hernia. He had not worn a truss for this for some years and had suffered no inconvenience from it at any time. On the evening of the 6th while in bed he complained of pain in the abdomen shooting to the umbilicus. Shortly after this he began to vomit greenish fluid and partially digested raw apples, of which he had partaken freely during

the day. The pain and vomiting continued during the night. The bowels were moved slightly in the morning, a constipated motion being the result. No medical man was called in until the 9th, fully two days after the illness began. The patient's condition then was that of one suffering from acute abdominal trouble. He had been vomiting brown frothy material which had a distinctly feculent smell. The abdomen was distended and some dulness was present in the left iliac region. There was what appeared to be a hernia in the left inguinal region. It was painful on pressure, could not be reduced, and gave no impulse on coughing. The temperature was 101° F. and the pulse was 120, hard, and wiry. The symptoms, both local and general, pointed to a left inguinal strangulated hernia. As the parents refused to have any operation performed palliative treatment was adopted until the 11th—i.e., five days after the onset of the attack. The patient was then admitted into the Huddersfield Infirmary. His condition was grave. There was persistent feculent vomiting, the tongue was dry, and a thick brown fur covered the dorsum. The temperature was normal and the pulse was 120 and feeble. The abdomen was distended, tympanitic in front, but dull in the flanks. There was complete absence of pain except on pressure at the umbilicus and over a tumour in the left inguinal region. On examining the tumour no impulse could be detected on coughing. It could not be reduced into the abdomen and was dull on percussion. The bowels were slightly moved by enema on the day of admission but no flatus had passed since. The only hope lay in an immediate operation and the hernia was cut down upon, but as there was considerable difficulty in getting through the sac the abdomen was opened above the internal abdominal ring, the intention being to examine the internal ring from within. The whole abdominal cavity was found to be filled with pus. No hernia was detected in the left inguinal canal although there was a hernial sac. The patient's condition admitted of little more than washing out the abdomen and draining it. His death which seemed almost a foregone conclusion occurred some five hours later.

Necropsy.—The post-mortem examination revealed a ragged ulcerated perforation in the vermiform appendix. A small hard nodule of fæcal material was found close to the appendix and had evidently escaped through the perforation and lodged in the peritoneal cavity. The abdominal cavity was in a condition of general septic peritonitis. The hernial sac on the left side was half an inch thick and communicated with the abdomen by an aperture admitting the little finger. The sac was filled with pus from the abdomen.

CASE 2. *Intestinal obstruction.*—A married woman, aged 52 years, was admitted into the Huddersfield Infirmary on Nov. 16th, 1898, under the care of Dr. E. A. Wright. She exhibited the usual signs of intestinal obstruction and there was a history of illness of five days' duration. The attack commenced whilst the patient lay in bed. She had always enjoyed fair health in the past. The case on examination was deemed so urgent that an immediate laparotomy was performed. At first no definite lesion could be found, but a piece of dark claret-coloured intestine close to the cæcum was discovered. The mesentery corresponding to this piece of bowel was also deeply injected and embedded in it was a calcareous gland. The intestine was thrown into a number of folds around this point but no actual obstruction seemed to exist. On removing the gland, however, the intestine appeared to liberate itself as evidenced by the intestinal contents passing on. The wound in the mesentery made after removing the gland gaped about two and a half inches, showing that some traction had been exercised by the mesentery on the intestine. The patient died soon after the completion of the operation.

Necropsy.—At the post-mortem examination the interior of the affected piece of intestine was found to be studded with a few small ulcers, showing that some interference with the nerve- and blood-supply of the intestine had taken place there. This was probably due to the nerves and blood-vessels being slowly pressed upon in the contracted piece of mesentery.

Remarks by Dr. BOYD.—The notes on the above cases may serve to give some idea of the difficulty in diagnosing rare and peculiar forms of intestinal obstruction. In Case 1 the obstruction seemed to depend on the presence of a strangulated hernia but was discovered later to be due to general septic peritonitis consequent upon perforation of the vermiform appendix. Here, then, a patient who was the subject of a left congenital hernia suffered from perforative appendicitis with its accompanying results simulating a strangulated hernia. The diagnosis might have been more accurate had a medical man seen the case at the outset. There might then have been local signs of appendicitis, but when the case was seen all local signs were masked by the general condition. In Case 2 the cause of the obstruction was not very clear but was thought to have some relation to a mass which could be felt per rectum on the brim of the pelvis. This idea turned out to be correct, but the mode in which the obstruction was brought about is so rare that I thought it would be interesting to place the facts on record. The case may be classed under the head of obstruction from what Fagge in his "Practice of Medicine" describes as contractions. He gives a list of 12 cases taken from Guy's Hospital Reports, but among these only three correspond with the above case. The mode of obstruction is peculiar from the fact that a definite point cannot be located beyond which the intestinal contents cannot pass. The obstruction is not produced by narrowing of the lumen of the gut but by the intestine being gathered into folds and one fold above pressing into and obstructing the lumen of the intestine below. This mechanism taking place at several points in a foot or more of intestine causes the obstruction. I have demonstrated this by taking a piece of small intestine with its mesenteric attachment and gathering the mesentery together. The intestines were immediately thrown into a number of folds and a condition of mechanical obstruction existed. In carrying out this experiment I ran a stream of water through a piece of small intestine several feet long. On making traction on the mesentery the intestine was thrown into folds and the water ceased to pass along the intestine, even although some pressure was made on the loops of bowel. On releasing the mesentery the obstruction was relieved and the water continued to run as before. I am indebted to Mr. Knaggs and Dr. Wright for permission to publish these cases.

Medical Societies.

ROYAL MEDICAL AND CHIRURGICAL SOCIETY.

Extirpation of Aneurysms.

A MEETING of this society was held on Feb. 28th, Mr. BRYANT, President, being in the chair.

Mr. W. J. WALSHAM read a paper on a case of Extirpation of a large Non-pulsating Aneurysm involving the Common, Internal, and External Carotid Arteries of the Right Side of the Neck, with remarks on Non-pulsation in Aneurysms and the Treatment of Aneurysms by Extirpation. The patient, a strong, healthy-looking man, 49 years of age, had noticed a small swelling for six years on the right side of his neck. It had grown slowly and without pain until a few months before he came under observation, since which time it had got rapidly larger. The swelling extended from the angle of the jaw nearly to the clavicle and from near the middle line in front passed deeply beneath the sterno-mastoid muscle. It was roughly globular in shape and generally hard in consistency but soft and fluctuating in places. The skin was not adherent and the swelling had no connexion with the larynx or bones. There was neither pulsation nor bruit and nothing escaped on puncture with an exploring syringe. It was thought that the swelling was glandular and probably malignant. An exploratory incision was made and the tumour discovered to be an aneurysm. No pulsation was detected at the operation. The common carotid was ligatured in two places below the sac and divided between the ligatures, the sac was dissected up, collateral vessels entering it were secured as met with, and finally the internal carotid was ligatured above. The sac was then removed entire. The patient made a good recovery. Mr. Walsham observed that non-pulsation in an aneurysm, except when it had become consolidated, diffused, or inflamed, appeared to be rare, only a few cases having been found recorded in literature. The cause of non-pulsation in these was not very evident, but was attributed either to leaking of the sac or to blocking of its mouth with clots. Nine cases of extirpation of carotid

aneurysms were quoted, all the patients recovering. The wider question of the treatment of aneurysms by extirpation was next discussed and a table of 33 cases of spontaneous aneurysms treated by extirpation was appended. The chief methods of extirpation employed were—(1) the old operation of opening the sac, turning out the clots, and securing the artery above and below; (2) the old operation plus the removal of the sac by dissection; and (3) the removal of the sac after the artery had first been tied above and below. The last method, slightly modified as in Mr. Walsham's case by dividing the proximal artery between two ligatures, dissecting up the sac, and finally tying the distal vessel, was submitted as the ideal method of extirpation. The conditions most favourable for extirpation appeared to be—(1) where there was insufficient room to apply a ligature to the artery on the proximal side or where the application of a proximal ligature was attended with great risk as ligature of the innominate for subclavian aneurysms; (2) where a number of large vessels communicated with the sac; (3) where other measures had failed to cure the aneurysm; (4) where the aneurysm, as in the popliteal artery, had become diffused or rupture of the sac or gangrene of the limb was threatened; and (5) where the setting free of emboli, as in carotid aneurysms, would be attended with risk of cerebral softening. From a review of the 32 cases and from the experience gained in his own case Mr. Walsham held that it was shown that the operation of extirpation might be looked upon as a most successful method of treating an external aneurysm and was perhaps the best that could be adopted in the conditions above mentioned. But for an ordinary popliteal aneurysm without complications enucleation could not be such a simple or satisfactory procedure as ligature of the popliteal or even of the femoral artery at the apex of Scarpa's triangle.

Mr. R. J. GODLEE mentioned an unpublished case under his care in which he excised the sac of a popliteal aneurysm. Ligature of the femoral artery at the apex of Scarpa's triangle was first performed, but as the pulsation returned extirpation of the sac was performed. As a tourniquet could be used there was not the trouble with hæmorrhage met with in Mr. Walsham's case. The enucleation was by no means easy, as there were many vessels coming out of the sac and there was great difficulty in freeing the sac from the vein. The operation was not at first satisfactory as there was much anxiety owing to the amount of œdema of the foot. Recovery was slow, it being several months before the patient could return to his occupation. The difficulties met with in this case made him disinclined to advise enucleation as a routine treatment for popliteal aneurysm. The condition of the artery must be ascertained as it would be most difficult to deal with the artery if it was much calcified. With reference to the cause of non-pulsation in some aneurysms Mr. Godlee suggested that one possible cause was from part of the aneurysm pressing on the artery below.

Mr. HOLMES referred to a paper which he published in the St. George's Hospital reports many years ago in which he attempted to account for the occasional want of pulsation in aneurysms. In one patient mentioned in that paper there was a tumour in the loin supposed during life to be either a renal tumour or an aneurysm. There was no pulsation and no bruit could be heard over it. It proved to be an aneurysm communicating by a very small aperture with the abdominal aorta. Another case was that of a man admitted for a fluctuating, non-pulsating tumour in the groin supposed to be a psoas abscess. It proved itself to be an aneurysm by rupturing, and it was found to have arisen from the abdominal aorta and to have tracked down to the groin. A bruit was often not detected because the nature of the case not being suspected it was not listened for. Nevertheless, in a number of cases it was certainly absent. Pulsation might be prevented by the aperture of the aneurysm being blocked by soft clot and so preventing the free exchange of blood to and from the artery. The size of the aperture would also affect the production of a bruit, as could be shown by imitating a bruit with the lips. If too large or too small an opening were made the sound could not be reproduced. He considered that the plan of treatment pursued by Mr. Walsham in his exceptional case was the best which could have been adopted.

Mr. PEARCE GOULD related a case in which ligature was performed on one side and extirpation of the sac on the other. The patient was a man, a soldier, 28 years of age, whose right femoral was ligatured for popliteal aneurysm by Lieutenant Hudlestone, R.A.M.C., in July, 1897. He was discharged from the army and in January, 1898, he came under Mr. Gould's observation with an aneurysm of the size of an orange in the other popliteal space. Mr. Gould decided to excise the sac, but the dissection of the entire sac was found to be so difficult from the close adhesion to the vein that the portion of the sac in contact with the vein had to be left. The interest of the case lay in the fact that while pulsation had not returned in the right tibials six months after the ligature of the right femoral it returned on the left side on the thirteenth day after excision of the sac. The man himself asserted that the discomfort from numbness and other signs of disturbance of the circulation was much greater after ligature. The operation of excision when it could be easily and cleanly performed certainly gave rise to a minimum disturbance of the circulation but where there was extensive adhesion of the vein it must be a perilous method. He asked why Mr. Walsham thought it so necessary to remove the whole sac. What was the objection to ligaturing the main vessels and cutting away those portions of the sac which could be easily removed? Mr. Gould also mentioned the case of a man, 69 years of age, who was very apt to faint. He had a popliteal aneurysm and it was thought advisable to ligature the artery as the shortest operation. Gangrene, however, supervened and amputation had to be performed. Possibly if excision of the sac had been performed the limb might have been saved.

Mr. A. A. BOWLBY had seen Mr. Walsham's patient and confirmed the statement that there was no pulsation of the tumour. He thought that there would always be a stage during the spontaneous cure of an aneurysm at which pulsation of the sac would be absent. Another factor was the diminution in calibre in the artery between the heart and the aneurysm which could be demonstrated in all museum specimens. Mr. Bowlby thought that this was due to the establishment of collateral circulation. As to the value of the operation of excision as opposed to ligature he thought that excision as a routine practice would expose the patient to unnecessary risk of bleeding and to injury of the vein. From observations on museum specimens he had satisfied himself that the artery near to a popliteal aneurysm was much more healthy than the artery higher in the thigh and that the ligature of the femoral at the apex of Scarpa's triangle was unnecessary. The ligature should be placed on the popliteal artery itself or on the femoral at the lower part of Hunter's canal.

The PRESIDENT agreed that the operation was the best in the present case but did not think that it should be substituted for the old method. There was much risk of wounding the vein and he well remembered that the cases of popliteal aneurysm which went wrong were those in which the vein was injured and thrombosis had occurred. He had excised small aneurysms in the forearm, foot, and in two cases in the course of the brachial artery and he had tried to excise a popliteal aneurysm in one case of a man over 80 years of age. The aneurysm had ruptured under the skin and the President first ligatured the femoral artery in Hunter's canal and then tied the artery on the other side of the sac and tried to excise the latter, but found it impossible to do so. The President emphasised the importance of examining for a bruit, as there might be a bruit even in a non-pulsating aneurysm.

Mr. WALSHAM, in reply, said that he believed that for ordinary cases dissection did not compare with ligature. In the case of popliteal aneurysm he agreed with Mr. Bowlby that the lower part of the femoral should be tied. He thought that if portions of the tumour and blood-clot were left that the risk of suppuration was greatly increased, and further that there was a risk of overlooking some collateral vessel the aperture of which might be only insecurely closed by blood-clot which might subsequently be dislodged and give rise to serious hæmorrhage.

MEDICAL SOCIETY OF LONDON.

Auto-Intoxication and its Relation to the Treatment of Disease.

A MEETING of this society was held on Feb. 27th, the President, Mr. EDMUND OWEN, being in the chair.

Dr. SIDNEY MARTIN read a paper on Auto-Intoxication and its Relation to the Treatment of Disease. He said that in the first place it was necessary to have a definite meaning

attached to the words "infection" and "intoxication," and by "infection" was meant the invasion of the body by a living germ which by itself or its products of activity injuriously affected the tissue, and by "intoxication" was meant the poisoning of the body by chemical agents usually the products of activity of the living germ. No definition of these processes could however be rigid and a typical example of "infection" was seen in anthrax when from the primary infection the bacillus invaded the body, and a typical example of "intoxication" in tetanus when the bacillus was localised to the seat of injury and the toxic substances were absorbed from this spot. In "auto-intoxication" the body manufactured its own poisons but the term comprised many different conditions, in some instances so widely different that he questioned the propriety of retaining the term. He described auto-intoxication under three headings: (1) auto-intoxication of gastro-intestinal origin; (2) auto-intoxication occurring in the course of chronic disease, such as chronic renal disease, diabetes, &c.; and (3) auto-intoxication occurring in association with the glands of the body, the thyroid, suprarenal pituitary body, and also with the liver, pancreas, and testicle. He pointed out that the activity of a tissue in disease might be altered and so produce symptoms in various ways—e.g., by interference with vascular and nervous supply, by the accumulation of products of its activity, by the preponderance in it of certain mineral salts, especially potash, and by the action on it of some poison of external or internal origin. It followed that the determination of the cause of the effect on the tissue might be difficult if not impossible; in other words, that what was observed as a symptom might be produced by many different causes which might throw an organ or tissue out of activity. A poison, he remarked, did not necessarily kill and, failing death, the final effect of the poison was in many cases the result of an action on various tissues and organs. This was particularly to be noticed with the poisons which acted in disease. In reference to auto-intoxication of intestinal origin the chief examples were ascribed to bacterial decomposition of the gastro-intestinal contents as distinguished from bacterial infection of the intestine. With the exception of the bacillus coli communis most of the intestinal bacteria were non-pathogenic. If, however, the products of putrefaction were absorbed the body was poisoned and this process frequently passed from one of intoxication to one of infection of the intestinal wall or of the peritoneum. He thought that intestinal bacterial intoxication should be grouped with the bacterial processes that occurred in disease and not as an auto-intoxication. Another form resulted from the indigestion of food, in which, in addition to the local symptoms, there were others described as remote or reflex. This subject was a very complex one and must be discussed in reference to auto-intoxication since during the process of digestion bodies were formed which possessed poisonous properties. He pointed out that normally in the process of absorption the albumoses were transformed by the mucous membrane of the stomach and gut into the proteids of the body, but it was quite possible that their occasional presence in the blood might account in part for some of the symptoms of disordered nutrition. Passing on to group 2 he observed that some of the cases must probably be ascribed to an auto-intoxication in which the poisons originated in the tissues of the body and were not due to bacterial activity. Although most of the proteid substances of the body were non-toxic some had a distinct physiological action, but it was quite possible that in disease some of the altered products might determine functional disturbances. He added that so far no poisons resulting from the splitting up of proteid or other body substances without the aid of bacteria had ever been separated. Discussing the nature of Bright's disease and diabetes he suggested that the symptoms of uræmia should be ascribed to the selective action of a poison or poisons on the cerebral centres. He referred to Bouchard's contention that in uræmia the normal toxicity of urine was greatly diminished, from which that observer inferred the retention of poisons in the body. The substances met with in diabetic patients which were not present in health were not very toxic and no poison had been isolated which would account for the phenomena though the occurrence of peripheral neuritis might be taken as evidence of an intoxication. He discussed cholæmia and anæmia from this point of view. He then passed on to consider the effects of removal of normal glands in respect of nutrition and their bearing on disease. The effects of their removal had, he said, been ascribed to the absence of an internal secretion which was normally given to the body and which was essential for the carrying out of certain physiological processes, or, on the other hand, the phenomena following removal might be due to the non-elimination of some poison inimical to life. In view of the well-marked physiological action of certain normal glands it was fair to suppose that in the normal body these glands formed substances as internal secretions which were essential to the maintenance of the complex physiological processes of health. But an excess of this very physiological activity might in itself be a determinative cause of disease.

The PRESIDENT after congratulating Dr. Martin on his paper said that he believed that rickets was a condition produced by auto-intoxication and that the poison probably arose from the gastro-intestinal tract. This condition had not been mentioned by Dr. Martin in his paper nor had the condition of peripheral neuritis following influenza. He mentioned two other conditions which he thought were due to auto-intoxication. The first was the sense of fatigue and headache which often occurred after unwonted exercise and the second was the disturbance of the renal function which sometimes followed massage.

Dr. MOTT said that with regard to auto-intoxication as affecting the nervous system he had worked at the subject on bio-chemical lines. In general paralysis of the insane well-marked degenerative changes took place in the nervous tissues of the body leading to the formation of a fatty substance which stained black with osmic acid. He had estimated the comparative amount of phosphorus in the two sides of a spinal cord from a case of hemiplegia and he had found that the amount of phosphorus was diminished on the degenerated side. The myelin became broken up into glyco-phosphoric acid and a neutral fat. In order to test the toxic action of the cerebro-spinal fluid a given quantity of normal cerebro-spinal fluid was injected into an animal; no effect was produced. The cerebro-spinal fluid from a case of general paralysis of the insane was injected and caused a very marked fall of blood-pressure. It was then found that an injection of cholin gave the same results. The platinum salt of the same body crystallised out produced the same effect. It seemed therefore probable that cholin was the toxic agent in general paralysis of the insane and was formed by the breaking up of the phosphoric fats into a neutral fat and cholin, the cholin being absorbed into the cerebro-spinal fluid, and some of the effects of the disease might be caused by the venous stasis caused by that body. Cholin acted upon the muscle fibres of the vessels and caused dilatation of the splanchnic vessels. Although cholin was poisonous it was not nearly so poisonous as neurin which caused a rapid fall of blood-pressure followed by a rise in pressure and respiratory spasm resembling in its effects the poison muscarine. Glyco-phosphoric acid injected into the body gave rise to no toxic effects. In the class of cases above referred to the cause of death was not obvious, but on examination of the various organs—heart, liver, kidney, diaphragm, &c.—very marked fatty changes were found. This was especially marked after epileptiform convulsions. One case, a youth, aged 18 years, had been examined; he was in perfect bodily health till two days before death when he was seized with epileptic fits and passed into a condition of status epilepticus from which he died, and on examination it was found that extensive fatty degeneration of his viscera and muscles was present. Insufficiency of oxygen probably accounted for the presence of fat in the muscle.

Dr. WASHBOURN considered the title "auto-intoxication" misleading as it had been applied to two distinct conditions; firstly, the intoxication due to the absorption of substances living or dead from the intestine, and secondly to the condition met with in cholæmia, uræmia, and similar diseases. In the first group many of the cases were infective and in the second group there was still lacking the proof that they were due to the circulation of poison in the blood. With regard to protection against infection by the intestine it would seem to depend on some condition of the mucous membrane which prevented the passage of bacteria and it was only when the nutrition failed that bacteria and the poisons produced by metabolic processes passed through the mucous membrane of the intestine. It was well known that pathogenic organisms were often found within the body; for instance, the diphtheria bacillus was found in the throat giving rise to no toxic symptoms, and it suggested that the body possessed some power of inhibiting the functions of the bacteria. In reference to the various forms of intoxication

occurring in disease of the liver and kidney it was pointed out that all the glands of the body possessed either a secretory, excretory, or metabolic function, and that the secretory and excretory glands had also a metabolic function and that it was probable that in uræmia the condition of the patient was not so much due to the retention of certain salts as to the altered nutrition of the cells of the kidney.

Dr. MARTIN replied.

The PRESIDENT announced that the Fothergill prize had been awarded to Dr. S. Monckton Copeman for his recent researches in connexion with glycerinated vaccine.

CLINICAL SOCIETY OF LONDON.

Exhibition of Cases.

A MEETING of this society was held on Feb. 24th, the President, Mr. LANGTON, being in the chair.

Dr. PARKES WEBER showed a case of Re-commencement of Muscular Atrophy long after infantile paralysis. The patient was a lad, aged 17 years, who suffered from severe infantile palsy at the age of two years. About four or five months ago he noticed loss of power in the right hand and wasting in the right thenar muscles. The original disease in infancy affected both right limbs, the right side of the face, and probably also the left lower limb. As a result the whole right lower extremity was wasted and almost completely useless. It was possible that the paralysis of the right arm and right half of the face, from which the patient recovered, were due to a temporary affection of the cerebral cortex (polioencephalitis of Strümpell) occurring simultaneously with the acute anterior poliomyelitis.

Dr. CAHILL showed a woman, aged 27 years, with Hypertrophy of the Right Breast due to pressure of the paralysed and contracted right arm. At the age of nine years she had right hemiplegia after diphtheria and the right arm became spastic and contracted, being firmly flexed and adducted so that the hand pressed on the thorax just above the mamma, and this breast had always been larger than the other. That this was due to the pressure was confirmed by the diminution which had taken place since the arm had been kept extended at night by a splint.—The PRESIDENT thought that the breast was not so much hypertrophied as displaced downwards by the arm.

Dr. H. A. CALEY showed a woman, aged about 40 years, suffering from Pulmonary Fibrosis associated with Tabes Dorsalis and Arthropathy. The patient first went to St. Mary's Hospital in October, 1896, with characteristic symptoms of tabes. As there was some cyanosis of her lips he examined her chest and found signs of pulmonary fibrosis, most marked on the right side, a cavity at the right posterior apex, and bronchiectasis at the right base. She had no cough or other pulmonary symptoms. There was a history of her having attended a hospital for chest trouble at the age of 13 years, and Dr. Caley thought that the chest trouble dated from then. In 1897 she developed painless effusion in both knees of the type described by Charcot in tabes. Dr. Caley regarded the association of the pulmonary and nervous diseases as purely accidental.

Dr. BERTRAM HUNT showed a boy, aged six years, suffering from Rheumatoid Arthritis with enlargement of the Spleen and Lymphatic Glands. While in hospital suffering from tonsillitis and broncho-pneumonia the knees and elbows became painful and then swelled. The effusion was not great and skiagrams showed that the bones were normal. There had been irregular pyrexia, the temperature sometimes reaching 104° F., progressive anæmia, enlargement of the lymphatic glands in the axilla and groins and considerable enlargement of the spleen. Bacterial examination of the synovial fluid gave negative results. Dr. Hunt thought that the joint disease had been secondary to the tonsillitis.

Dr. WASHBOURN and Mr. ARBUTHNOT LANE showed a woman from whom Mr. Lane removed a Tumour growing from the pia mater over the arm area two years ago. The case was recorded in the Transactions of the Clinical Society, vol. xxx., p. 154. Permanent paralysis of the right arm had followed the operation but she was otherwise in good health and there had been no recurrence of the fits from which she previously suffered.

Mr. C. E. MOUAT-BIGGS showed a young man suffering from Factitious Urticaria. The patient was a healthy athlete who had never suffered from urticaria from any of the usual causes, but remarkable urticarial wheals could be induced anywhere on his skin by drawing lines on it with any blunt instrument. A white wheal rose on a scarlet background forming an elevation of quite an eighth of an inch. This reached its maximum in five minutes and faded in the course of an hour. There was not the least itching or discomfort. Pressure alone brought them about. Some cases had been described in which similar wheals were produced by local cold such as that by ether spray, several of the patients having also paroxysmal hæmoglobinuria, but neither of these conditions existed in this patient.

Dr. RAYMOND CRAWFURD (with Mr. LOCKWOOD of Sheffield) showed a well-marked example of Myositis Ossificans Progressiva in a boy aged six and a half years. There were no traceable evidences of rheumatism in the family, though the child himself had disease of the mitral valve which presumably was rheumatic. Injury, as in so many cases, appeared to have been the direct exciting cause at two and a half years old. The bony growths for the most part seemed to have originated from the spinous processes of the vertebræ and to have spread into the retro-vertebral muscles, more particularly the latissimus dorsi and trapezius, the child's back being traversed in several directions by elevated ridges of bone. The fixed curvature of the spine and the rigidity of the cervical muscles gave the child a very characteristic attitude. The upper arms were glued to the sides by ossification of the humeral attachments of the latissimus dorsi on either side. Skiagrams were handed round to show the actual condition of the thumbs and great toes. The shortness of the thumbs was chiefly due to shortness of the metacarpal bones and their rigidity to synostosis of the first and second phalanges. In the great toes the metacarpal bone was completely united by bone to the first phalanx and the effort of nature to compensate this condition had resulted in a throwing outward of the ungual phalanx beneath the second toes.

Dr. LEONARD GUTHRIE showed a case of Myopathy in a child, aged four years. The disease appeared to have been congenital. The child had never been able to walk or stand. He could sit up, but easily fell backwards and was unable to rise. All the muscles were extremely weak, but in the arms he could perform most movements although feebly. In the legs there was almost complete loss of power. There was diminution of both faradaic and galvanic irritability but no definite reaction of degeneration.

Dr. GUTHRIE also showed a boy, aged six years, with Infantile Paralysis affecting Both Arms and also the Intercostal Muscles, so that the breathing was purely diaphragmatic. The legs were unaffected.

Dr. STCLAIR THOMSON showed a man, 36 years of age, complaining of Dysphagia and found to be affected with unilateral paralysis of the eighth and bulbar nerves. He had complained of giddiness and deafness for three years and a year ago he became hoarse and had difficulty in swallowing. On examination his left vocal cord was found to be paralysed. There was no œsophageal obstruction. Six months ago his palate became paralysed on the left side and taste was lost on the back of the tongue on that side. The pulse had been rapid throughout. There was no specific history, but considerable improvement followed a course of mercury and iodide of potassium.

Sir HUGH BEEVOR showed a case of Chronic Rheumatic Arthritis in a man, aged 60 years. It was almost confined to the metacarpo-phalangeal joints in either hand. The fingers were flexed to the ulnar side. This was attributed to the use of his hands in working the large "sweeps" of a barge.

Dr. HARRY CAMPBELL showed a case of Asthenic Bulbar Paralysis in a woman, aged 29 years, which he believed to be the fourth reported in this country. The paralysis was incomplete but became much aggravated if the muscles were used. Symptoms showed themselves 15 months ago, when she noticed that she had difficulty of utterance if she sang for a short time. At the present time all the muscles ordinarily concerned in bulbar paralysis were affected by this curious weakness and also the anterior part of the occipito-frontalis, and occasionally there had been loss of power in the arms when they had been raised for a time. The symptoms were always better in the morning after a night's rest. No lesion had been found in the brain in any of the recorded cases. There was no sensory change and the electrical reactions were normal.—Dr. J. A. ORMEROD said that he had seen an exactly

similar condition affecting the upper muscles of the thigh in a man.

Mr. A. H. TUBBY showed a man, aged 65 years, suffering from Multiple Sarcomatous Tumours of the Skin. The primary tumour was in the upper part of the right side of the scrotum and was noticed six months before. A second tumour appeared on the left side and then one under the jaw. Now there were hundreds, some of them of considerable size, all over the surface of the body. The liver was enlarged and there was some jaundice.—The PRESIDENT referred to a similar case and commented on the small disturbance of the general health which such patients presented.

Mr. TUBBY also showed a child with an Anterior Congenital Dislocation of the Hip. He remarked that this form was more common than usually described, being present in one-third of the cases. It was uncertain whether the condition was due to intra-uterine dislocation or birth dislocation. In this case he had tried to replace the bone but had failed as there was no definite acetabulum.

EPIDEMIOLOGICAL SOCIETY.

Typhoid Fever.

A MEETING of this society was held on Feb. 17th, the President, Dr. FRANKLIN PARSONS, being in the chair.

Dr. BOOBBYER, medical officer of health of Nottingham, read a paper on Ten Years' Experience of Typhoid Fever in a Midland Town. In this, he said, his first aim was to show "the definite causal relation subsisting between the accumulation of organic filth in dense urban districts and the endemic occurrence of enteric fever." The labours of Pettenkofer in directing attention to the soil as the proper habitat of the typhoid poison, the discovery of the bacillus by Eberth, Gaffky, and Klebs, and the confirmation of Pettenkofer's doctrine by Dr. Sidney Martin's studies of the behaviour of the bacillus had brought order out of chaos, but there was still much to learn as to its life-history in relation to the endemic and epidemic prevalence of the disease. The reports of Sir R. Thorne, Dr. Bulstrode, and others showed that in this country there was a growing conviction that too much importance had been attached to the agency of water and milk as seen in occasional outbreaks to the neglect of the conditions on which typhoid fever depended in its annual and more permanent prevalence. After giving an account of the routine practice and of the provision of hospital accommodation in Nottingham and a full description of the physical and geological conditions of the district, the elevation of the different parts of which varied from 80 to 400 feet above the normal level of the river Trent, and which for the most belonged to the Bunter sandstone and red marls of the Trias, except on the south where the soil consisted of alluvium and gravels, he described the remarkable holes and caverns in the rock which were constantly met with in sewerage and building operations and which were frequently utilised as cesspits, the cleansing and filling up of which was often a work of considerable difficulty. Prior to the Act of 1845 there was within the limits of the ancient city a population of over 50,000 crowded on 927 acres of sewage-sodden, pervious soil. Extensive rookeries had been cleared by the railway construction now going on, the excavations revealing a depth of 30 feet of made soil, yielding relics of many centuries of occupation as did also the black, cheesy organic deposits which filled the ancient town ditch. The Borough Extension Act of 1877 brought in a number of villages and districts which were being rapidly built over, nearly 1000 houses having been erected in each year of late, many of them in the "Meadows," a low-lying district exposed to floods. From the year 1700 the water-supply had been drawn from the Trent till 1856, when a succession of borings were made in the rock at a distance from the town, which now enjoyed a supply of 21 gallons daily per head of excellent water. The sewers were all of modern construction and were well planned, the sewage (from 6,000,000 to 7,000,000 gallons daily) being conveyed to a farm of 1300 acres six miles away partly by gravitation and partly by pumping. But there were still only 10,000 water-closets; in 400 houses midden-privies were retained and the remainder were provided with 40,000 pails. The death-rate from typhoid fever was always above the mean of the "great towns," except in 1879, 1892, and in 1886, for the deaths in the early months of that year belonged properly to the great wave of the previous autumn. In these years the mean temperature of the summer and autumn was distinctly below the average and the mortality from diarrhœa was also very low, but there was nothing to be noted in the rainfall. No relation could be traced between the soil or elevation and the incidence of the disease; between altitudes of 100 and 300 feet above ordnance datum; or between the back-to-back houses in the city and the detached cottages of Radford. Poverty, dirt, overcrowding, soil-pollution, and retention of fæcal matters in privies or pails were the essential conditions. In one low-lying district where large quantities of "made soil" were deposited on the alluvium and gravel for the purpose of raising the site the incidence of the fever was increasing yearly. Here, too, the foul mud left behind after floods added to the pollution of the soil, but the portion of the Meadows to the south of the Trent, at the same level and on the same subsoil, enjoyed comparative immunity, the houses being of a better class and made soil not being used. Throughout the district 86 per cent. of the cases occurred in houses having five rooms or less and 14 per cent. only in those having more, though these latter constituted from 45 to 50 per cent. of the whole number. The incidence of the disease on houses with water-closets was one in 558, with pail-closets one in 120, and with midden-privies one in 37. It might be objected that the first were for the most part of a better class, but the difference between the two latter groups was striking and could not be thus explained, or otherwise than by the soil pollution inseparable from privy-middens which was aggravated by the frequent practice of depositing the filth during its removal on the ground, and perhaps again in the street before carting it away. Though the disease was not so highly infectious as scarlet fever or measles he was convinced that it was far more easily and frequently spread by personal intercourse than was generally believed. Uffelmann and Germano had shown that the bacilli retained their vitality for a long time when sufficiently dried to be blown about as dust, and he had had to investigate several outbreaks which could not be explained otherwise than by personal intercourse, the evidence of which was complete. In the general hospital 848 cases had been treated in 10 years, and 22 of the staff had contracted the disease, or 2·5 to 100 patients. In the same period there had been 157 cases in the children's hospital, 11 cases occurring among the staff, or 7·0 to 100 patients. He had thus at length overcome the reluctance of the authorities to provide for the isolation of what they had held to be a non-infectious disease. He had traced several outbreaks to contaminated milk, but none to shell-fish, notwithstanding the enormous consumption of mussels, &c., by the colliers. His conclusions were: 1. That a sustained mean temperature of over 55° F. usually preceded an autumnal rise in the prevalence of typhoid fever, a low summer temperature having the opposite effect. 2. That the disease was endemic in poor, crowded urban districts, irrespective of elevation or of geological formation wherever favourable conditions, especially soil pollution, were present. 3. That even in the presence of such conditions as made soil and pail-closets the better class of houses suffered less than the poorer similarly circumstanced. 4. That the incidence was heavier on houses with dry closets than on those with water-closets and among the former on those with middens than on those with pails, the difference being more marked the poorer the class of houses. 5. That it was directly communicable by personal intercourse even in well-arranged hospitals, and much more so in the confined dwellings of the poor.

The PRESIDENT remarked on the parallelism of typhoid fever and summer diarrhœa in their relations to temperature and on the immunity acquired by residents in insanitary localities. He thought that much harm was done by underrating the communicability of typhoid fever by personal intercourse.

Dr. SEATON felt that too much attention was directed to water as a means of spreading typhoid fever to the neglect of local conditions. There seemed to be no generally accepted method of dealing with typhoid excreta, but the life-history of the bacillus outside the living body offered a wide field for research that the Jennerian Institute would do well to take up.

Dr. WHITELEGGE had found the acclimatisation of the inhabitants of the poorer quarters to render vain his denunciation of the practice of building on made soil or over the rock caves; but he had often noticed that the occupiers of

the better houses in such localities were attacked after their return from the seaside.

Dr. BULSTRODE said that no one who had lived in a fever hospital could doubt the fact of personal infection. As to shell-fish it should be borne in mind that cockles were always cooked and mussels, &c., were frequently so, oysters only being habitually eaten raw.

Dr. WILLOUGHBY pointed out that typhoid fever when water-borne appeared as an epidemic or explosive outbreak, the endemic and annual recurrent prevalence being dependent on local and permanent insanitary conditions. He believed that with typhoid fever, as with cholera, personal infection was mostly the result of "eating with unwashen hands" after attending to the patient, which would account for its being almost unknown in private practice save in the confined dwelling rooms of the poor, and might explain its far greater frequency among the nurses in the children's hospital than among those in the general hospital as noticed by Dr. Boobbyer.

Dr. THEODORE THOMSON thought that too much importance had been attached by Dr. Boobbyer to the kind of closet, for in some water-closet towns, as Liverpool and Birkenhead, the typhoid fever death-rate was 0·36 and 0·32 per 1000, while in the midden towns of Bradford, Oldham, and Halifax it was only 0·16, 0·17, and 0·13 though he did not doubt that the former would be still worse with middens and the latter better with water-closets. The experiments of Dr. Sidney Martin and others on the growth of the bacillus in polluted soil were very instructive and should be followed up by local investigation of soil conditions generally.

Mr. SHIRLEY MURPHY pointed out the fact that the young nurses in the hospitals of the Asylums Board were attacked in much greater numbers than the older women in the London Fever Hospital. In London the local prevalence of typhoid fever was in direct proportion to that of poverty as shown in Mr. C. Booth's maps. The high death-rate in Liverpool might be due to the social habits of the large Irish section of the population.

Dr. BOOBBYER, replying, observed that the water-closet houses were not exclusively of a better class, for all new cottages, being built now at the rate of 700 yearly, were thus provided; nor were those with privies the worst, they being mostly old houses of a fair class on the outskirts, none now remaining in the city itself. Pails were dangerous in the dwellings of the poor but not where they were used with due care, 1000 such houses having never been attacked. The treatment of the typhoid excreta recommended in handbills was that they should be absorbed by sawdust, disinfected with one in 1000 sublimate, and then burnt. He assured Dr. Bulstrode that the mussels so largely consumed by the colliers on Sundays were very rarely cooked, yet these people suffered less than those in some other quarters.

LIVERPOOL MEDICAL INSTITUTION.

Exhibition of Cases.—Pylorectomy.—Vaginal Section.

A MEETING of this society was held on Feb. 23rd, the President, Dr. MACFIE CAMPBELL, being in the chair.

Mr. HUGH E. JONES exhibited patients on whom the operation of Discission of the Crystalline Lens had been performed for High Myopia.

Mr. FRANK T. PAUL submitted a case of Cholecystectomy for Gall-stones and Cancer. The tumour was a small villous carcinoma of the fundus of the gall-bladder which was removed together with the upper half of the organ and 13 gall-stones. The patient recovered from the operation in a few weeks, but in two and a half months died from enlargement of the liver, which was apparently not due to recurrent cancer but to some inflammatory condition probably set up by stones in the hepatic ducts.—Mr. RUSHTON PARKER remarked that few operations were more gratifying to the surgeon and patient than the removal of gall-stones; he took it that Mr. Paul in this case excised the gall-bladder because it was discovered in the search for gall-stones to be cancerous. It appeared to be removeable and he was not thereby advocating the general removal of similarly affected gall-bladders as hinted at by one speaker.—Dr. IMLACH, Dr. E. T. DAVIES, and Dr. W. ALEXANDER spoke.

Mr. ROBERT JONES showed a case of Myositis Ossificans exhibiting unusual characters. The patient was a youth, aged 16 years, who came to him because of difficulty in flexing his knee, caused by a hard mass apparently attached to the upper two-thirds of the thigh, which interfered with muscular action. Further growths were found on the inner aspect of the right jaw below the ramus, a small lump below the right olecranon, thickenings at the insertion of the right ligamentum patellæ, and at each first tarso-metatarsal joint. His back presented an extraordinary spectacle. Over the spinous processes a continuous line of hard material, cartilaginous or bony, extended from the level of the fifth dorsal to the fourth lumbar spine. This central ridge bifurcated at the lower end, the extremities of the bifurcated portions almost reaching to the iliac crests. From the central ridge two transverse strips projected at the upper end and two at the lower, almost symmetrical in appearance. The upper ones arose about the level of the seventh dorsal and were about two inches in length, the lower ones at the level of the second lumbar, the right being about three inches long and the left two inches. These prolongations were moveable and the fingers could be placed under their tips. The patient was unable to stand absolutely erect from the fact that extension of the spine resulted in the jamming of structures in contact with the lower end of the prominence. Four years ago the patient fell on a doorstep and hurt his back; a year later the growth started in the centre of the spine. The origin of the tumour of the jaw cannot be fixed. The thickening at the elbow started after a blow and the tumour of the thigh had lasted four months. Mr. Jones proposed to remove the growth on the back and any other deposits which might interfere with breathing.—Mr. RUSHTON PARKER considered that the hard material on the back did not appear to be situated in muscular tissue so much as in fascia. The material in the left thigh might be of the nature of myositis ossificans, while the small spike under the right side of the lower jaw had distinctly the feel of being situated in the muscle. It would appear that some general state of the system accounted for this curious disease and it was stated that the boy's mother was very rheumatic at the present time. If removed partially or wholly an opportunity would be given to examine its histological appearances.

Dr. ALEXANDER read notes of a case of Pylorectomy for Stenosis of the Pylorus in which Murphy's Button was employed and the patient quickly recovered.—Mr. RUSHTON PARKER said that cases such as that threw great light upon the question of ulcerated stomach. The cicatrices mentioned by Dr. Alexander and found by himself in a recent case of pyloroplasty for stenosis together with the long-continued dyspeptic symptoms seemed to suggest the cicatrisation of ulcers as a cause. In his case a small ulcer actually existed at the time of operation on the stomach side of the narrowed pylorus. In neither of the two cases operated on by himself was the mucous membrane of the narrowed part itself the seat of recognisable scarring which existed only in the neighbourhood.—Mr. F. T. PAUL thought that the specimen shown was a congenital stricture. He would not dispute the wisdom of selecting pylorectomy in this case, but he might say that pyloroplasty had a much wider range in its suitability for long and narrow strictures than some were disposed to admit.

Dr. BRIGGS read a paper on Vaginal Section, mainly based on 16 operations in his practice. In 13 posterior vaginal section and in three anterior vaginal section was the operation performed. The cases treated by posterior vaginal section included five of hæmatocele due to ectopic pregnancy, three of tubo-ovarian cyst (ovarian hydrocele), one of simple papilloma of both ovaries, one of hydrosalpinx, one of chronic infective salpingo-oöphoritis, and two of chronic infective metro-salpingo-oöphoritis (with hysterectomy), 13 in all. Anterior vaginal section included three of chronic salpingo-oöphoritis with retroversion, for each of which after the removal of the ovary and tube the uterus was steadied forwards by vaginal fixation. In hæmatoceles the vaginal drain was employed in chronic cases and the important question seemed to be—Was it necessary to empty or remove the Fallopian tube in cases of incomplete tubal absorption or tubal mole? The uncertainty of being able to recognise the tubal condition ought not to be disregarded until it had been shown that drainage alone was sufficient. In three cases a portion of the outer end of the tube was removed and in two cases the tube was neither felt nor seen. All the cases, with one exception where the patient was lost sight of, recovered equally well. Operators seemed to agree that the tubes and ovaries might be left

behind. Available evidence pointed towards posterior vaginal section as the treatment of chronic hæmatocele distending the pouch of Douglas. Tubo-ovarian cysts, simple papillomatous growths, and salpingo-oöphoritic lesions, if accessible from below, could be removed from the pouch of Douglas by posterior vaginal section. It was evident that where there were matting, thickening and firm fixation, especially towards the lateral walls of the pelvis, there was difficulty in securing the pedicle. More room was obtained by removing the uterus which in infective inflammations was often, as Landau had urged, in an incurable state. Dr. Briggs removed the uterus in two of the cases quoted because of the conditions alluded to. One patient lost her life from hæmorrhage 30 hours after operation; the hæmorrhage had been concealed behind the cyanide gauze pack. This case was a posterior vaginal section for adherent hydrosalpinx with thickened broad ligaments and an enlarged stiffened uterus. The specimen was carefully examined post mortem; the stump was apparently securely held by the silk ligatures still *in situ;* the end of the stump was swollen and its margins were recurved; the uterine artery was tested by injection and water oozed through the vessels of the stump, but a thicker pigmented starchy solution would barely pass. Shrinkage of the stump and difficulty in securing the proper constriction of thick rigid tissues rendered tense by forcible traction during operation explained the incomplete hæmostasis. The results in the cases of removal of the appendages with vaginal fixation for retroversion effected by anterior vaginal section were too recent to report upon. In the 16 cases there had been one death from hæmorrhage as reported.—Mr. BURTON had not himself opened Douglas's pouch for hæmatoceles, as all his cases during one year got better very well without, and he agreed with Dr. Briggs that they generally did if left alone; at the same time he was of opinion that by operation the patient's stay in hospital would often be shortened. He had opened the peritoneum per vaginam six times during the year for inflammatory tubal affections, removal of enlarged ovaries, and once for removal of a dermoid containing about 12 ounces of fat. There was less shock than by the abdominal route. By this operation a scar was avoided as was the danger of ventral hernia in the cicatrix.—Dr. E. T. DAVIES thought that vaginal section was only practicable in a minority of cases of pelvic disease—viz., small tumour formations and inflammatory products which encroached upon or were adherent to the pelvic floor, early ectopic pregnancies with recurrent or dripping hæmorrhages, or suppurations which became encapsuled in Douglas's pouch. These if they do not recover spontaneously by absorption, as many do, may be safely and easily opened and drained through the posterior fornix. The fulminating ectopic ruptures with copious hæmorrhage into the general peritoneal cavity with intense collapse should always be attacked from above by laparotomy. Pus tubes and ovarian abscesses with dense adhesions to the pelvic floor might more safely be opened from below. There could be no doubt, however, that the abdominal route by laparotomy offered far greater facilities for precision in diagnosis, dealing effectively with adhesions and stanching hæmorrhage, the whole field being so much better under the control of the operator than is possible by the vaginal route.—Dr. GEMMELL referred to the absence of shock after vaginal section due probably to the absence of physical irritation of the peritoneum from the cooling and handling of the intestines which was inevitable in abdominal section. He did not agree with the view that by the abdominal route a better inspection of the field of operation could be obtained, for by means of the anterior vaginal incision the uterus and appendages could be turned out for inspection and replaced with little or no irritation to the patient. Whilst convalescence was rapid there was greater freedom from pain and the vaginal incision cicatrised early, yet, just as in abdominal section, the wound did not always heal by first intention and hernia might occur.—Dr. GRIMSDALE considered that owing to the want of accurate diagnosis in pelvic disease the vaginal operation should be limited to the most simple cases. Slight errors in accurate diagnosis were more likely to assume grave proportions during vaginal operation than during abdominal operation. He did not suppose that anyone would contend that the actual opening of the peritoneum was safer in one place than in another. The case of the operation would therefore be in the long run the measure of the safety of any method.—Dr. BRIGGS replied.

LEEDS AND WEST RIDING MEDICO-CHIRURGICAL SOCIETY.

Malignant Disease of the Œsophagus.—Exhibition of Specimens and Lantern Demonstration.

A PATHOLOGICAL meeting of this society was held on Feb. 17th, Mr. C. J. WRIGHT, Vice-President, being in the chair.

Dr. POWELL WHITE read a short communication on Malignant Disease of the Œsophagus and showed the following specimens:—1. Sarcoma of the Pharynx. The primary growth was a small ulcer in the right sinus pyriformis; it did not invade surrounding structures. The glands in the neck formed a mass half as large as the man's head. There were metastatic deposits in the liver, lungs, and heart. 2. Lymphosarcoma of the Mediastinum invading the Heart and the Œsophagus. 3. Cystic Kidneys in an Adult. The left kidney weighed 4 lb. 14 oz. and the right 2½ lb.; he thought that their origin was a congenital malformation. 4. Multiple Diverticula of the Small Intestine from the same patient as the cystic kidneys. There were about 30 diverticula situated along the mesenteric border of the small intestine; they were formed by protrusion of the mucous membrane through a deficiency in the muscular coat. 5. Spheroidal-celled Carcinoma of the Upper End of the Œsophagus with Metastatic Deposit in the Stomach.

Dr. BEDFORD PIERCE (York) showed:—1. Intracapsular Fracture of the Femur in a male, aged 64 years, the line of fracture being immediately below the articular surface of the head of the bone. In this case there was no shortening until some weeks after the injury. 2. Repair of Fracture of the Radius under most unfavourable circumstances, the patient being 84 years of age and maniacal, and no treatment was possible. Nevertheless, the bone had united well. 3. A Diverticulum of the Bladder the cause of which was obscure. The diverticulum was about half the size of the bladder and connected with it by an opening that would just admit a goose quill. 4. Brain of a Microcephalic Idiot of low type. Dr. Pierce pointed out that the posterior lobes were small relatively to the rest of the brain and that they failed to cover the cerebellum. He remarked that the brain when first removed weighed 38 oz. and that after being hardened in formalin for six weeks it had gained 10 oz. in weight.

Mr. GOUGH communicated a short paper in which were detailed the Microscopical Changes in the Lymphatic Glands, Spleen, Liver, and Lungs from a case of Hodgkin's disease. The paper was illustrated by microscopical preparations.

Dr. WEST SYMES (Halifax) showed a Dermoid Cyst of the Ovary containing fully-formed teeth, hair, skin, and bone from a patient, aged 39 years. At the operation the cyst was found to be very adherent to surrounding structures. The adherent vermiform appendix was removed with the tumour. The patient was discharged after an uninterrupted recovery.

Dr. CHURTON showed:—(1) A Thoracic Aneurysm which had pointed in the axilla; and (2) the Parts involved in a Subphrenic Abscess.

Dr. R. H. HALL showed a Perforated Gastric Ulcer from a young man, aged 22 years. The symptoms were indefinite and death rapidly took place.

Dr. EURICH (Bradford) showed:—(1) A Large Ulcer of the Stomach, death having been due to hæmorrhage; (2) a Primary Sarcoma of the Sternum; and (3) a Glioma of the Brain from a boy, aged five years.

Dr. HELLIER showed a specimen of Hæmorrhage into the Ovaries and a Skiagram of Congenital Deformity.

Dr. EDGERLEY (Menston) showed a specimen of Porencephaly in which the area involved extended from considerably in front of the position of the anterior limb of the Sylvian fissure on the left side to the posterior parietal lobule and from the upper part of the second frontal convolution above to the inferior temporal sulcus. In this area the brain cortex was entirely absent and the white matter was represented only by a thin membrane separating the cystic space from the lateral ventricle on the inner side. The outer wall was formed by the pia arachnoid membrane. The optic thalamus was atrophied and the opposite half of the cerebellum was much reduced in size. The pyramidal tract on the same side was diminished in the crus, pons, and medulla. The patient from whom the brain was taken had died at the age of 43 years and had been a congenital hemiplegic imbecile who had

suffered from epileptic fits for 15 years before her death. The area involved corresponded to the distribution of the middle cerebral artery—a fact supporting the theory of vascular occlusion as a probable cause.

Mr. LITTLEWOOD showed among other specimens:—(1) Tuberculosis of the Flexor Sublimis Tendon secondary to Disease of the Synovial Sheath; (2) a Pedunculated Subsynovial Lipoma removed from the knee-joint; and (3) Cysts of the Left Ovary and Half of the Right Ovary also containing Cysts removed from the same patient.

Dr. WARDROP GRIFFITH showed two specimens of Pneumonic Lung, one of which was associated with infective endocarditis; also specimens of Malformation of the Tricuspid Valve and of Abnormal Chorda Tendinea in the Left Ventricle.

Mr. MOYNIHAN showed among other specimens:—(1) Three Examples of Acute Perforating Appendicitis; (2) Intussusception in a dog; (3) Photographs and Watercolour Drawings from cases of Retro-peritoneal Hernia; and (4) (with Dr. GRIFFITH) Right and Left Duodenal Herniæ.

Mr. MOYNIHAN and Dr. POWELL WHITE showed a Tumour removed by operation from the Retro-peritoneal Tissues occupying the positions of the suprarenal body and kidney which were entirely absent; the mass also extended into the scrotum. Microscopically it consisted of myxomatous tissue containing fat and the remains of glandular epithelium.

Mr. WARD and Dr. POWELL WHITE showed a Retro-peritoneal Tumour removed by operation. Microscopically it was a lympho-sarcoma.

Mr. WALTER THOMPSON showed an Epithelioma of the Upper Jaw arising from the nasal surface.

Dr. ALLAN showed among other specimens:—(1) The Intestines from a case of Typhoid Fever in a woman, aged 70 years; (2) Ulcerative Colitis apparently due to Influenza; and (3) a Collar-like Stricture in the Lower Part of the Œsophagus.

Dr. BRONNER (Bradford) showed numerous microscopic specimens demonstrating the Various Growths of the Nares—sarcoma, cylindroma, papilloma, myoma, adenoma, carcinoma, tuberculous growths, &c.; also specimens illustrating the degenerative and hypertrophic changes which take place in the mucous membrane of the nares.

Dr. TREVELYAN showed:—(1) Diphtheria Bacilli from a case of Membranous Stomatitis without involvement of the Fauces; and (2) True Hypertrophy of One Lung from a Case of Long-standing Quiescent Disease of the other Lung.

Dr. TREVELYAN and Mr. SECKER WALKER showed Sections through the Cerebrum and Cerebellum from a case of Suspected Intracranial Abscess. There was no abscess found, although during life the symptoms were so marked as to necessitate an exploratory operation. The specimen showed considerable hæmorrhage along the tracks of the exploring trocar. No gross lesion such as would account for death was found in the body. More than 40 microscopic preparations were shown illustrating the naked-eye specimens.

Professor BIRCH gave a lantern demonstration on the Commoner Blood Spectra produced by Drugs and Poisons.

New specimens recently added to the Anatomical and Pathological Museums were shown by Dr. GRIFFITH and Dr. TREVELYAN respectively.

ROYAL ACADEMY OF MEDICINE IN IRELAND.

SECTION OF SURGERY.

Dislocations and Fractures of the Astragalus.—Excision of the Cæcum.

A MEETING of this section was held on Jan. 20th, Mr. R. L. SWAN, the President, being in the chair.

Mr. H. GRAY CROLY read a paper on Dislocations and Fractures of the Astragalus, giving a history of several cases. In one case fracture of the body of the astragalus was caused by a horse falling on a man's foot which was caught in the stirrup. Mr. Croly excised the bone and the man was enabled to resume his work as a groom. In a case of compound luxation of the astragalus forwards and outwards the bone was completely displaced from all its attachments; the head and neck of the bone protruded. Mr. Croly excised the astragalus. The accident was caused by the man jumping from a vehicle and alighting on his heel; the foot was forcibly inverted; the internal malleolus was completely buried; the patient made an excellent recovery and can walk as well as ever. The third case was one of complete simple luxation of the astragalus forwards and outwards. The patient, a man in his sixty-ninth year, slipped off the kerbstone into the channel, violently twisting his foot inwards. On examination by Mr. Croly 11 days afterwards the right foot was found to be forcibly inverted, the head and body of the astragalus resting on the dorsum of the foot externally; the skin over the head of the astragalus was red and shining; the internal malleolus was completely buried, a deep groove taking its place; there were two sloughs on the outer side of the foot (ashy grey) and a large deep slough on the inner side of the foot; there was no movement at the ankle; the patient's health was much impaired. About two months after the injury Mr. Croly excised the astragalus. Immediately on the enucleation of the bone the muscles drew the foot into its normal position and a suitable splint, with footboard, was applied. The patient made an excellent but somewhat slow recovery and he now can walk without the aid of a stick; an extra sole on his boot makes up for the slight shortening; he has an ankle moveable but perfectly firm.—Mr. LENTAIGNE exhibited a cast of Fracture of the Astragalus. This particular injury was exceedingly rare. It was a fracture of the anterior portion of the astragalus, with displacement forwards and outwards of the fractured head of the bone, and was caused by jumping off a car. After an interval operation was allowed. The loose head of the astragalus was found to be completely detached from all structures except by a few threads of fibrous tissue. The head of the astragalus was reduced and the wound was closed.—Mr. W. I. WHEELER mentioned a case of Dislocation of the Astragalus backwards the result of a blow by a cricket ball on the front of the foot when in the flexed position. He said that Mr. Henry Hancock's statistics of 109 cases of complete removal of the astragalus for compound dislocation, simple dislocation, and disease showed 14·6 per cent. death-rate.—The PRESIDENT said that he had often had occasion to remove the astragalus for aggravated equino-varus in the adult.

Mr. JOHN LENTAIGNE exhibited a patient from whom he had removed the Cæcum and a Small Portion of the Ileum for Chronic Intestinal Obstruction resulting from Stricture at the Junction of the Ileum and Cæcum. The patient, a girl, aged 12 years, had come under his care on April 16th, 1898. She was then in a very miserable condition, vomiting frequently and rejecting almost all food; the abdomen was greatly distended. The bowels were very constipated, no motion ever coming except after the administration of purgatives followed by enemata. The illness had commenced two years before. On April 22nd Mr. Lentaigne opened the abdomen in the median line and gave temporary relief by forming an intestinal fistula in two stages after first emptying the distended ileum by enterotomy. On incising the gut two large basinfuls of pea-soup-like fæces flowed out and the intestinal cavity was irrigated and washed out with a stream of warm water; the opening was then closed by silk sutures and the gut was returned to the abdominal cavity. When emptied and flattened out the intestine seemed to be about four inches across from the lower margin to the mesentery. The left hand of the operator was introduced into the cavity and directed well over to the left side; it was then cut down upon and the bowel was securely fastened to the opening by a few sutures passing through the parietal peritoneum, muscle and skin. The incision in the median line was closed with three layers of sutures, the two deeper of silk for peritoneum and muscle and the superficial of catgut for the skin, covered by a layer of celloidin. The small opening on the left side of the abdomen was kept open by a plug of iodoform gauze and on the third day after operation the fistula was made complete by an incision into the bowel. There was an immediate improvement in the patient's condition. The bowels emptied themselves continuously through the fistula and the vomiting and attacks of pain ceased almost at once. On June 27th, as the patient had got into a good condition and was anxious to be relieved of the annoyance of the fistulous opening, excision of the cæcum was performed with end-to-end suture of intestine by Kocher's method. The bowels acted naturally four times on June 29th and almost every day after. The intestinal fistula closed of itself as soon as the bowels acted normally and on July 12th it had practically closed, neither fæces nor flatus coming through it. It was now represented by a firm, clean scar, no trace of the opening existing. The patient was in excellent health and condition, the bowels

acting regularly every day.—Mr. CROLY congratulated Mr. Lentaigne on the success of the operation which he said would not have been undertaken a few years ago.

NORWICH MEDICO-CHIRURGICAL SOCIETY.—Meetings of this society were held at the Norfolk and Norwich Hospital on Feb. 7th and 21st, the President, Mr. W. E. Wyllys, being in the chair.—A discussion took place on the Aims and Objects of the National Association for the Prevention of Consumption and other Forms of Tuberculosis.—Sir Peter Eade opened the discussion, speaking first on the necessity of educating the public and referring to the increased knowledge of tuberculosis. He mentioned some striking facts which would appeal to the public—e.g., that one-tenth of the population died from it and that phthisis kills in England alone from 40,000 to 60,000 annually. The Norwich mortality for 1897 was 2062, of which 238 were due to tuberculosis. Prevention included attention to expectoration, provision for healthy cows, and pure meat; but as many other sources of the disease might exist they must not be too sanguine as to at once stamping it out. Referring to the inspection of slaughter-houses Sir Peter Eade thought that more good would be derived from Government inspectors than from medical men.—Dr. S. J. Barton observed that the strongest argument against notification was that it would intimidate the earliest incipient cases from applying to their medical advisers at a time when there was the best chance of cure by the fear of being publicly branded as "consumptives." The two conclusions from all that had been written and spoken lately on the subject of tuberculosis were—(1) that the disease was infectious and spread by avoidable causes—viz., atomised sputum and milk, &c.; and (2) that when infected the open-air treatment gave the best chance of cure.—Dr. Burton-Fanning observed that there were already 20 branches of the association in process of formation and he sincerely hoped that the outcome of that meeting would be the starting of one in Norwich. He described the objects of the association as twofold: the education of the public as to the common channels of infection and the erection of sanatoria for those already attacked. The public must be enlightened as to the danger of consuming milk from tuberculous cows and should demand from dairymen a guarantee that the tuberculin test was used and acted on by them. They must also be warned of the infectivity of discharges from patients with tuberculosis and of the simple means of obviating that. He added that at more than one place the establishment of a sanatorium had been followed by a diminution in the number of consumptive natives. Owing to the precautions taken the risk of infection at a special institution for phthisis was reduced to a minimum.—Dr. Cooper Pattin, medical officer of health of Norwich, was of opinion that it was absurd to start upon a campaign against tuberculosis without informing themselves of the number and disposition of the sufferers from the disease, and this knowledge they could best acquire by notification. He therefore placed in the first rank notification of all tuberculous diseases with, as a necessary corollary, the establishment of hospitals for the segregation of the dangerous cases, in particular persons who could not have even a room set apart for their use in their own homes. Next he placed regular inspection of dairy cattle and the tuberculin test, though he warned members that in his judgment many exaggerated statements had been made about ridding the world of intestinal tuberculosis in children; they would lower that amount, he hoped, but they would not eradicate the disease. Milk in his opinion was often contaminated in the dwelling. So important did he think infection in the dwelling that for five years he had carried out systematic disinfection after the death or removal of a tuberculous patient wherever he could gain consent to do so. Dr. W. M. Crowfoot advised affiliation with the central association so as to obtain good speakers for a public meeting. He hoped that changes would be brought about in the management of dairies, but he feared that little help was to be obtained so far from the Government. There ought to be fully-equipped sanatoria for the poor.—Mr. S. H. Long observed that they did not all regard the infection in the same light. Being due to the tubercle bacillus, a facultative saprophyte, it was both of a direct and indirect nature; the former, he thought, played a minor part in the spread of the disease, whereas the latter mode of infection could never be entirely got rid of and hence the disease could never be stamped out.—Dr. Beverley thought that the milk ought to be thoroughly investigated.—The President thought the meeting must decide on some practical resolutions.—Dr. Burton-Fanning then moved: "That the members of the Norwich Medico-Chirurgical Society are in favour of the establishment of a branch of the National Association for the Prevention of Consumption and Other Forms of Tuberculosis for Norwich and District."—This was carried unanimously.—Mr. Haynes Robinson moved the next resolution: "That a committee be formed to carry out suggestions and to call a public meeting and that the following be nominated as members of the committee:—for the city: Dr. Barton, Dr. M. Beverley, Dr. Burton-Fanning, Dr. J. Fielding, Dr. Cooper Pattin, and Mr. Haynes Robinson; for the county: the President, Dr. Crowfoot, Mr. H. C. Dent, Dr. Reeve Manby, Dr. C. A. Owens, and Mr. H. Bournes Walker, with power to add to their number."—This was carried unanimously.

BRITISH ORTHOPÆDIC SOCIETY.—A meeting of this society was held at the City Orthopædic Hospital, Hatton-garden, on Feb. 17th.—Mr. Jackson Clarke showed a case of severe Talipes Calcaneo-valgus of congenital origin. He pointed out that there was no defect of the fibula. The child after birth showed a tendency to fold the legs on the front of the abdomen with the feet together. He suggested that this had been the position in utero and was the cause of the deformity. The patellæ were dislocated outwards. In this and other respects the child had much improved under treatment by manipulations and splints.—Mr. Muirhead Little showed two cases of Supposed Injury to the Shoulder at Birth. In both there was a history of difficult labour, one being instrumental and in the other there was difficulty in delivering the shoulders. In both there was marked inward rotation of the arm at or just below the shoulders and the movements of that joint were very limited, in one case so much so that paralysis was suspected, but electrical examination showed that it was not present. The head of the humerus felt unduly prominent behind and there was a distinct depression in the region of the neck as though the diaphysis were displaced forwards and inwards. He had diagnosed separation of the epiphysis with rotation of the lower fragment. Massage and manipulations had effected some improvement. He had skiagraphed the parts but at this early age (three and five years) ossification was not advanced enough for much to be shown.—Mr. Jackson Clarke thought the cases were subacromial dislocations.—Mr. John Poland said that he had seen the case referred to by Mr. Jackson Clarke. He thought Mr. Little's cases were cases of injury to the upper end of the humerus. He believed that in such cases occurring in labour there might be an altered condition of the bone due to syphilis.—Mr. William Thomas thought the finger in the axilla in delivering was responsible for such cases.—Mr. Keetley thought that paralysis could not be excluded in one of the cases at least.—Mr. Poland then showed specimens of Fractured Neck of the Femur with vicious union in a youth, aged 21 years, with symptoms like coxa vara. He had excised the head of the femur and the redundant callus that prevented movement.—Mr. Poland also showed a specimen obtained by Excision of Dislocation of the Shoulder with Separation of the Great Tuberosity. There was no broadening of the shoulder such as was described in text-books. The patient had now a useful arm.—Mr. Poland also showed the cast of a case of Hallux Varus coming on at the age of 12 years in a congenital club-foot. There was some wasting as if from paralysis. He was inclined to excise the joint but it had proved unnecessary. He also showed a case of Hallux Valgus from no apparent cause. He had excised the joint.—Mr. William Thomas showed a Wrench for the Treatment of Talipes. He did not think that wrenching alone would cure talipes, but whatever could be done by wrenching this instrument would enable them to do.—Mr. Chisholm Williams showed casts of cases of Webbed Fingers from Burns and of Great Progressive Hypertrophy of the First and Second Toes in a girl, aged four years, first noticed three weeks after birth.—Mr. Noble Smith thought that it was a case of diffuse lipoma.—Mr. Jackson Clarke thought that diffuse osteoma could not be excluded.—Mr. Poland agreed that it was probably diffuse lipoma but suspected that the bones were enlarged.—Mr. Muirhead Little recalled a somewhat similar case shown by Dr. Robert Jones in which all the tissues were hypertrophied.—Mr. Chisholm

Williams also showed the cast of a Hand with Webbed Fingers from a Burn which he had successfully treated.—Mr. Keetley showed a Patient and a Skiagraph. The case, he thought, was one of coxa vara. The patient was 19 years old and had had very severe knock-knees straightened by another surgeon by means of instruments. She had only then been able to hobble by lifting the upper part of each instrument with her hands. She now wore no instruments and could not walk at all. He remarked on the peculiar open face of the patient which he thought he had noticed in another case of coxa vara.—The proceedings closed with a vote of thanks to the committee of the hospital.

SOCIETY OF ANÆSTHETISTS.—A meeting of this society was held on Feb. 17th, the President, Dr. Dudley Buxton, being in the chair.—Mr. McCardie read a paper upon the Method of Prolonging Anæsthesia under Nitrous Oxide Gas by the use of a Mouth Tube. Since seeing Mr. Coxon's plan of injecting warmed nitrous oxide into the back of the mouth by means of an oral injector he had experimented and found the following plan to answer well. The patient is anæsthetised in the usual way. The nose is then clamped and a central gag being used a curved mouth tube is introduced just within the mouth and a supply of gas is injected with each inspiration. The buccal cavity thus becomes a sort of reservoir of gas and an anæsthesia of several minutes' duration can be obtained.—The President remarked that the quantity of gas required was an obvious disadvantage. The clamping of the nostrils by lessening the patient's powers of expiration would tend to prolong anæsthesia under any circumstances.—Mr. E. Willett felt that the use of oxygen with nitrous oxide was superior to any method of giving that gas.—Mr. C. C. Braine pointed out that no method of giving gas and oxygen afforded a "working anæsthesia" of several minutes which was obtained by the use of the mouth-tube.—Dr. Flux described his method of obtaining anæsthesia by nitrous oxide by the "open method." He had found that by dropping the nitrous oxide from the tube into a towel arranged about the sides of the face and around the chin but leaving the face above the level of the nose quite free he obtained a sleep-like anæsthesia and avoided all the discomfort and dread of "taking gas." He now employed cup-shaped celluloid face-pieces open above and obtained excellent results. The period of induction was no longer than ordinary and when anæsthesia was obtained he could prolong it by occasionally injecting gas into the mouth. It was necessary to prevent the gas escaping below. The induction and recovery were like going to sleep and awakening from it.—Mr. Bellamy Gardner referred to experiments with closed inhalers which showed that high percentages of air prevented anæsthesia.—Mr. H. Baldwin and Mr. C. C. Braine spoke of their experience of Dr. Flux's method and both expressed their gratification at the results which they had witnessed.—After remarks from Mr. Willett, Mr. Tyrrell, and Mr. Low, Dr. Flux in replying said that the test of anæsthesia was the absence of sensation, the observation of lid and conjunctival reflex and the general sleep-like appearance of the patient.—Mr. Burns narrated four cases illustrating the value of the mixture of oxygen with nitrous oxide for patients who were bad subjects for ether or chloroform during surgical operations. In the first case the patient whose finger was amputated was a man, aged 53 years, very fat, an alcoholic, and suffering from aortic disease with albuminuria and glycosuria, and from a cough. He took the anæsthetic well. In the next two cases the patients suffered from empyema and in the fourth the patient, a young man who was to have a Thiersch skin-grafting performed, took the anæsthetic well at first but became slightly cyanosed with cessation of respiration later and required artificial respiration. This case illustrated the advantage of being able to throw in plenty of oxygen as by Hewitt's more recent apparatus. His older pattern was used, but it afforded too little oxygen and hence the asphyxia complication related.—Mr. Harvey Hilliard narrated a case in which a youth who although subject to being faint had never fainted, passed into syncope while taking nitrous oxide and oxygen. The syncope occurred at the moment of incision into a furunculus in the auditory meatus and was, Mr. Hilliard believed, caused reflexly by irritation of a branch of the vagus. He also read notes of a case of a Fit of Spasmodic Asthma following the inhalation of nitrous oxide gas and air in an asthmatic subject.

MIDLAND MEDICAL SOCIETY.—A meeting of this society was held on Feb. 8th at the Medical Institute, Birmingham, the President, Dr. W. G. Lowe, being in the chair.—Mr. Jordan Lloyd showed the Pelvic Genitalia which had been removed post mortem from a woman, 36 years of age, who had died from acute general pulmonary tubercle. She had never menstruated but had always had fair health, although somewhat delicate in childhood. The cervix uteri was normal in structure and one inch and a quarter long. The body of the uterus was small, about one inch and a half long. Its cavity was obliterated and contained old cretaceous tuberculous deposit. Each Fallopian tube was blocked by a cretaceous nodule of the size of a pea within an inch of the fundus uteri. Up to the points of blockage the tubes were of normal thickness, but beyond this they were atrophied to about two millimetres in diameter. The fimbriæ of the right tube were open and those of the left were closed by old peritoneal adhesions. The ovaries were normal in size and structure and contained Graafian vesicles. Many of the mesenteric glands were full of ancient tubercle which had evidently been laid down many years before. The vagina was normal. The absence of menstruation was clearly due to the obliteration of the uterine cavity and the plugging of the Fallopian tubes as above described. There was no other tubercle in the abdominal or pelvic cavities.—Mr. Jordan Lloyd also showed a Left Kidney removed successfully by lumbar nephrectomy from a woman, aged 20 years, who had suffered since childhood from periodical attacks of lumbar pain with diminished urine and the appearance of a tumour in the lumbar region, the symptoms disappearing with polyuria and the disappearance of the tumour. It was intended to transplant the ureter by a new attachment to the renal pelvis, but at the time of the operation there were practical difficulties in the way of carrying out this procedure satisfactorily. The kidney was therefore removed. The stalk of the kidney was first clamped by Doyen's forceps and the vessels and ureters were tied separately. The forceps were then removed. The patient made an easy recovery.—Mr. Christopher Martin showed an improved form of Steriliser. It consisted of two chambers, the lower chamber being used for boiling instruments in soda solution, whilst the upper chamber was for steaming dressings, towels, gauze swabs, &c. The lower chamber was large enough to hold an ordinary pair of midwifery forceps. The steam was conducted from the lower to the upper chamber by a pipe which delivered it near the top of the latter. Near the floor of the upper chamber three small holes were made to permit the escape of steam. By this arrangement the current of steam in the upper chamber took place from above downwards. He had also had a strong brown canvas case made into which the upper chamber could be packed; it then formed a convenient and perfectly aseptic method of carrying instruments, dressings, swabs, &c., from the surgeon's house to the patient's.—Mr. Martin also showed an Acetylene Lamp for Surgical Operations. It was essentially an acetylene bicycle lamp to which a convenient handle had been applied and to which he had had fitted a reflector which could give either a horizontal or a vertical beam of light. The whole packed into a neat leather case. It gave a brilliant light, was inexpensive (compared with electrical lamps), and was very portable. Its only drawback was the somewhat objectionable smell which all acetylene lamps gave off. Both the steriliser and the acetylene lamp had been made for him by Mr. Ash, Edmund-street, Birmingham.—Mr. J. Furneaux Jordan read a paper on the Advantages and Disadvantages of Vaginal Cœliotomy.

NORTH OF ENGLAND OBSTETRICAL AND GYNÆCOLOGICAL SOCIETY.—A meeting of this society was held at the Medical Institution, Liverpool, on Feb. 17th, Dr. Donald, the President, being in the chair.—Dr. S. Buckley read the notes of two cases of Fibroids Complicating Pregnancy in which abdominal section was performed. Case 1 was that of a patient, aged 28 years, pregnant three and a half months. The fundus uteri was pushed to the left by a firm rounded swelling reaching up to the umbilicus and was very tender to the touch. On opening the abdomen the mass was found to be a soft fibro-myoma springing from the right side of the uterus. It was not pedunculated and could only be removed by abdominal hysterectomy. As the symptoms were not urgent the abdomen was closed. The patient made a good recovery and five months later was delivered naturally of a full-term child. Case 2 was that of a patient, aged 28 years, five and a half months

pregnant. A tumour of the size of a large cocoanut was found to be attached to the left side of the fundus. It was freely moveable, very hard, and had caused severe pain, the result of localised peritonitis. When the abdomen was opened a pedunculated myoma was found attached to the left cornu of the uterus and adherent to the omentum. The pedicle was transfixed and ligatured in the ordinary way and the tumour removed. The patient made an uneventful recovery and is now almost at full term.—Dr. Arnold Lea read the notes of a case of Sarcoma of the Ovary occurring in a girl aged 13 years. The tumour which had attained the size of a seventh month pregnancy had been noticed for four months and had grown rapidly. The tumour lay somewhat to the left side, was very soft and was moveable. Per rectum the uterus was felt to be small and separate from the tumour and a pedicle could be made out on the left side. There was no ascites. The patient had menstruated normally twice. Abdominal section was performed. The tumour was adherent to the great omentum which was removed along with it. The right ovary was normal and was not taken away. The patient made a good recovery from the operation. The tumour was a soft sarcoma, very vascular, and showing numerous hæmorrhages. Microscopic sections showed it to be of the round-celled variety. The prognosis of sarcoma of the ovary in young girls was very bad. Of 26 cases recorded as operated upon seven died as the result of the operation —i.e., 27 per cent. Recurrence within a short time was very frequent, most cases dying from secondary growth within a year of the operation.—Dr. W. K. Walls read a communication on the Treatment of Severe Accidental Hæmorrhage, generally concealed, based upon a personal experience of 38 cases and he discussed the treatment of their condition. He maintained that rupture of the membranes as generally advised was injudicious owing to the inertia of the uterus generally present in these cases. He upheld the value of the plug and dilator combined, as in de Ribes's bag. He suggested that after delivery of the child if the uterus remained inert and did not respond to ordinary stimuli vaginal hysterectomy might be justifiable, stating that many of the fatal cases of concealed accidental hæmorrhage were brought about by the intractable post-partum hæmorrhage so commonly experienced.—The discussion on this paper was adjourned till the next meeting.—Various specimens of uteri were shown by Dr. Walter, Dr. Briggs, Dr. Gemmell, and Dr. Grimsdale.

CHELSEA CLINICAL SOCIETY.—A meeting of this society was held on Feb. 21st, Mr. J. Foster Palmer, President, being in the chair.—Dr. Herschell read a paper on Atony and Dilatation of the Stomach. He pointed out that atony was an unrecognised cause of many functional gastric troubles and that it was far more important to know the muscular state of the stomach than to make exact analyses of its contents. He divided atony of the stomach into three degrees: (1) the stomach took longer than normal to empty itself, but there was no absolute retention of food débris; (2) there was occasional food retention; and (3) there was constant food retention. The last two groups caused dilatation. As to its causation he noted—abnormal relationship between food and the stomach, intrinsic weakness of the stomach walls, and anatomical conformation of the stomach. The symptoms of atony of the stomach he considered were due to (*a*) local conditions, (*b*) reflex, (*c*) malnutrition, (*d*) defective absorption of water, and (*e*) absorption of toxins. Dr. Herschell then discussed the methods of physical examination and illustrated the splashing sound and auscultatory percussion upon a phantom consisting of inflated rubber bags. He thought that the only certain sign of dilatation of the stomach was the finding of food residues before breakfast. He laid stress upon the necessity for a prolonged and serious course of treatment and exhibited Turck's gyromele and his own apparatus for applying medicated hot air and the alternating needle bath to the interior of the stomach. Dr. Herschell also discussed electricity (showing an intra-gastric electrode), massage, diet, and drugs.—The President, Dr. William Ewart, Mr. Vinrace, and Mr. Nitch-Smith took part in the discussion which followed and Dr. Herschell replied.—Mr. A. F. Penny read a paper on the Radical Cure of Hydrocele, the discussion of which was postponed until the next meeting.—Dr. William Ewart showed a case of Chronic Rheumatism characterised by intense pain and immobility treated successfully by ice massage.—Mr. Vinrace showed a pathological specimen of Perforation of the Stomach due to Gastric Ulcer.

DERMATOLOGICAL SOCIETY OF GREAT BRITAIN AND IRELAND.—An ordinary meeting of this society was held at 20, Hanover-square, W., on Feb. 23rd, the President, Dr. Radcliffe Crocker, being in the chair.—The following cases were shown and discussed:—The President: (1) Acne Varioliformis in a man; and (2) Elephantiasis Græcorum in a woman—leprosy in its earliest stages in a healthy-looking young patient.—Dr. P. S. Abraham: Father and child with Tinea Tonsurans. Each had a small patch on the back of the scalp. A specimen of the fungus (probably large-spored) was shown under the microscope.—Dr. A. Eddowes: A man with Folliculitis Necrotica. —Mr. W. T. Freeman (for Dr. Stowers): A case of Lichen Spinulosus in a woman.—Mr. W. T. Freeman: (1) A case of Leuco-melanoderma in a woman; (2) a case of Senile Seborrhœic Warts in a woman; and (3) a doubtful case of Rodent Ulcer upon the forehead of a woman.—The President, Dr. Bowles, Dr. Abraham, Mr. Hope Grant, Dr. Eddowes, and others joined in the discussions.

GLASGOW MEDICO-CHIRURGICAL SOCIETY.—The ninth meeting of the session was held on Feb. 17th, when Dr. T. K. Dalziel showed a successful case of Laparotomy for Perforated Enteric Ulcer, the first of its kind in Glasgow.—Mr. R. H. Parry showed a case of Impacted Extra-capsular Fracture of the Femur treated by incision over the trochanter and replacement of the fragments in proper position. The patient was going about in seven weeks and there was no shortening left.—Dr. J. G. Connal showed a very large Nasal Polypus with Cystic Degeneration which had existed for at least 18 months without causing inconvenience.—Dr. Glen showed a specimen of a Heart with a Single Ventricle from a child who lived to the age of five months.—Dr. R. M. Buchanan showed a drawing of a Heart with a Single Ventricle and a Single Auricle.

Reviews and Notices of Books.

General Physiology, an Outline of the Science of Life. By MAX VERWORN, M.D., Ph.D., Extraordinary Professor of Physiology in the Medical Faculty of the University of Jena. Translated from the Second German Edition and edited by FREDERICK S. LEE, Ph.D., Adjunct Professor of Physiology in Columbia University. With 285 Illustrations. London: Macmillan and Co., Limited. 1899. Pp. 615. Price 15*s*.

THIS work is one of those that will bear reading twice and reading carefully. The reader must not expect to find any details in regard to the functions of the body—no text-book description, for example, of the organs of digestion or circulation or of the structure or functions of the organs of sense. It is strictly confined to the consideration of those broad and general principles and facts which are common to all animals alike and the subject is treated in an original and very interesting manner. We may add that the translation reflects great credit upon Dr. Lee, being smooth and intelligible throughout.

It is well that from time to time a general review of such a subject as physiology should be made by a competent man—that we should, as it were, take stock of our possessions and determine what rests on solid fact and what is still debateable ground. Physiology has connexions with many sciences and its advances stand in close relation with the progress made in many very different fields of research. Its development consequently proceeds irregularly; at one time it receives an impulse in a special direction owing to the extension of chemical knowledge; at another, new fields of research are opened out by the improvement in physical appliances, as in the superior construction of the microscope and in the graphic method of registration; whilst in yet another the application of the electric means of research supplies the means by which physiological knowledge becomes increasingly exact and precise. Experimental investigation, embryology, and comparative anatomy have all contributed to raise physiology to the high position it

at present holds, and when we reflect on the extremely unsatisfactory nature of our conceptions of the things which we name atoms and molecules and of the forces by which they are affected, and also on the wonderful variety in composition in structure and function of living animals, the physiologist may bear with equanimity the gibe cast upon him by the physicist and the mathematician that his subject has not yet risen to the rank of a science. Professor Verworn, after giving a short but excellent history of physiology, discusses the question of vitalism and a vital force. Are the phenomena which present themselves to our observation in living beings, he inquires, the effects of known forces, as chemical affinity, light, heat, and electricity acting on the atoms of matter, or do they require for their explanation the admission of a "vital" force differing from, though perhaps correlated with, those forces? The idea is an old one and has been often controverted but as often reappears; it is admitted indeed that many of the phenomena are explicable upon physical and chemical principles, but there still remain many phenomena which at present apparently call for other principles and seem to follow other laws. Consciousness, for example, cannot be explained by what we at present know either of chemistry or of physics, nor are we as yet sufficiently advanced to express in symbols the exact composition of a living cell and we recognise only with difficulty the difference between dead and living protoplasm; we recognise it indeed not by any difference in its chemical or physical characters but, as Pflüger pointed out, by the fact that "the atoms of the dead proteid molecule are in a condition of stable equilibrium, while the living proteid molecule possesses a very labile constitution." As might be expected in a work on general physiology, protoplasm, or living substance, its forms, activities, and attributes, are given in great detail. Here and there, indeed, statements are made which require some modification, as in the remark that in the tissues "every individual protoplasmic territory which belongs to a nucleus is sharply separated from all the rest," whereas it might be more correctly maintained that in many cases each cell is by means of protoplasmic processes both in animals and plants in direct continuity with the rest. Protoplasm the author holds to be a fluid and he gives one more to the already numerous definitions of life—viz., that it consists in the metabolism of proteids.

The Phenomena of Motion are grouped together and treated in a very interesting manner by Professor Verworn. He begins with the consideration of Brownian movement which he regards as of a passive nature and due to the constant slight impulses of the molecules of the surrounding liquid upon the small light bodies suspended in it. This is followed by an account of the movements caused by swelling of cell walls, as is seen in the resurrection plant (Selaginella lepidophylla), the rose of Jericho, the seeds of the cranesbill, and the elaters on the spores of the horsetail. He goes on to describe the movements due to changes in cell turgor consequent on osmosis which are to be seen in many plants; then come movements from change of the specific gravity of the cell, as in numerous low forms of pelagic life which seem to have the power of suddenly eliminating a tiny bubble of carbonic acid gas; then there are the movements associated with secretion, as in the desmid Closterium which discharges a slimy substance from one extremity of its body by the aid of which it creeps or glides; then come the movements due to growth as in the seeds of the impatiens; and, finally, there are the movements effected by contraction and expansion of the cell body, including amœboid, ciliary, and muscular movements, to which Professor Verworn has, it is well known, devoted much attention. He also, although under a different heading—namely, that of Stimuli and Their Actions—gives an interesting account of the effects of long-continued stimulation upon the microscopic appearances of muscle and nerve, illustrating these effects by references to the observations of H. M. Bernard on bluebottle flies, some of which were allowed to remain at rest, whilst others were stimulated till they were exhausted, and those of Hodge on the ganglion cells of the sparrow as they appear in the morning and at night.

Many of the subjects discussed are either altogether passed over, or are only noticed in the most cursory manner, in the ordinary text-books, such, for example, as the Origin of Life, the Question of Physical Immortality, and the History of Death. In regard to the origin of life the author considers in detail the doctrine of spontaneous generation; the theory of Cosmozoa which holds that the first life on the planet was brought by meteorites, removing the difficulty backwards by one step only, for the question immediately arises, How did it make its appearance in them? the hypothesis of Preyer to the effect that the idea of living substance having been at some time derived from lifeless substance may possibly be a false assumption and that the question to be asked is rather, Has lifeless originated from living substance? In contrast, therefore, to the doctrine of spontaneous generation Preyer puts forward the idea that living substance is the primary thing and that lifeless substance is derived from it secondarily by excretion. "Whoever," Preyer says, "interrupts the series of successive generations of organisms by the introduction of a generation without previous parentage is arbitrary. *Omne virum e viro* is a proposition which has never experienced an exception." These views are, however, more or less fanciful and scarcely commend themselves to common sense. Professor Verworn himself seems to favour the more suggestive utterances of Pflüger who contends that the beginning of life is in remote times and is to be looked for in the formation of cyanogen. For belief in this he points out there are numerous reasons. In the first place cyanogen and its compounds, such as potassium and ammonium cyanide, hydrocyanic acid, cyanic acid, &c., arise only in an incandescent heat. Then cyanogen is a radical possessing a great quantity of internal energy. Cyanic acid, a product of the oxidation of cyanogen HCNO, possesses great similarity to living proteid. Both cyanic acid and living substance grow by polymerisation, by chemically combining similar molecules like chains into masses. Both bodies in the presence of water are spontaneously decomposed into carbonic acid and ammonia. "Both afford urea by dissociation; that is, by intra-molecular rearrangement, not by direct oxidation. Finally, both are liquid and transparent at low temperatures and coagulate at higher ones, cyanic acid earlier, living proteid later." This similarly is so great that cyanic acid may be termed a half living molecule. Pflüger observes: "When we think of the beginning of organic life we must not think primarily of carbonic acid and ammonia, for they are the end of life and not the beginning." In concluding our remarks here we do so not because there are not many topics of interest to which attention might be directed but because our space is limited and we should like our readers to read the book for themselves and from it they will, we are sure, derive both pleasure and instruction.

A Clinical Text-book of Medical Diagnosis for Physicians and Students. By OSWALD VIERORDT, M.D., Professor of Medicine at the University of Heidelberg. Authorised Translation, with Additions by F. H. STUART, M.D. Fourth American Edition from the fifth German. With 194 Illustrations. London: The Rebman Publishing Company. 1898. Pp. 603. Price 24*s.*

THE earlier editions of this work are probably known to many of our readers. The fact that five editions have been called for in nine years is sufficient proof that the efforts of the author have met with the success which they deserved. Dr. Vierordt is remarkable for his powers of observation and

the facility with which he places his conclusions in the form of words. The present volume is replete with numerous valuable facts and suggestions to aid the student and the medical practitioner in the examination of patients.

Every part of each subject is dealt with in the greatest detail. The introductory remarks on taking the history of the case, for instance, show the thoroughness with which every point has been considered. The conclusions which may be arrived at from a "general examination" of the patient are also well given, especially the remarks on the varying conditions of "the skin and subcutaneous cellular tissue."

The author writes with particular clearness on the Examination of the Respiratory Apparatus. It is very difficult to express in words the pathological sounds and signs which are encountered in percussing and auscultating the chest, but a careful study of Dr. Vierordt's remarks will greatly aid the student in understanding the alterations from the normal in both methods of procedure. No book can, indeed, take the place of practical instruction in percussion and auscultation, but at the outset of his medical studies the student frequently becomes confused owing to the numerous new terms with which he is confronted and needs some book such as the one now under consideration to help him to fully understand what he has heard from his instructors at the hospital. Unfortunately the nomenclature of physical signs is by no means determined, the numerous synonyms being differently employed by physicians. It is to be regretted that the report issued by the members of the committee appointed at the International Congress of London in 1881 to draw up a uniform nomenclature of physical signs in the diagnosis of diseases of the chest has not been more generally adopted.

The chapter on the Examination of the Circulatory Apparatus contains a vast amount of information; the description of the variations in the rhythm and character of the heart sounds is facilitated by some simple diagrams. The examination of the blood is particularly well described and a mass of detail, interesting to an expert but of little value to the practitioner, has been wisely omitted, but sufficient is inserted to enable the student to make a full investigation of the blood in the various forms of anæmia and to recognise the malaria parasites.

The modern requirements of the examination of the digestive apparatus are met by full directions as to the chemical and microscopical analysis of the digestive juices. Great stress is laid by some observers on the importance of such examinations, more particularly the chemical. Considerable discomfort is thereby caused to the patient, but it is open to doubt whether the more exact knowledge which is claimed to be thus acquired will materially alter the treatment hitherto adopted after an ordinary examination of the patient with due attention to the clinical history. We believe we are correct in saying that the use of test meals and the frequent passing of the stomach tube required for the purpose have not found much favour in this country.

The chapter on the Examination of the Urinary Apparatus is also marked by the judgment exercised on the selection of the chemical processes required. Only a few tests are given for the detection of albumin and sugar but they are the most reliable and they can confidently be employed in general clinical work.

We consider that the directions for the examination of the nervous system form one of the best chapters in the book, especially that part of it which deals with electrical tests. This subject is a very difficult one for students to grasp, but the author explains in clear terms what should be observed in determining the electrical reaction, especial stress being naturally laid on the reaction of degeneration and the myotonic reaction. In future editions we would suggest to the author that he should enter into rather more detail as to the existence or absence of the knee-jerk, pointing out the diagnostic knowledge thereby attained in differentiating between organic and functional diseases. The book is well produced, the type, illustrations, and binding being everything that could be desired.

Manual of the Diseases of Children. By JOHN MADISON TAYLOR, A.M., M.D., Professor of Diseases of Children, Philadelphia Polyclinic; and WILLIAM H. WELLS, M.D., adjunct Professor of Obstetrics and Diseases of Infancy in the Philadelphia Polyclinic. London: H. Kimpton. 1899. Pp. 720.

THE authors tell us that their aim in writing the book has been "to present in a clear and concise manner the chief points in the description, differentiation, and treatment of diseases of children" and they have carried this out most successfully. They have kept to their text—Diseases of Children—and have not padded their book out by unnecessary descriptions of adult types of disease—a temptation to which writers on the subject are very apt to succumb.

There are excellent accounts of the growth of infants and of their various organs followed by a very clear exposition of the principles of infant feeding. Where artificial feeding is necessary the authors follow Rotch in their recommendations and give full instructions for the modification of cow's milk, so that any desired percentage of proteids, carbohydrates, and fats can be obtained. The section on Diseases of the Alimentary Canal, so important in the first two years of life, is full of sound teaching and apt hints on treatment. It is the best section in the book. In America tuberculous peritonitis, if the statements in the book are correct, appears to be much less amenable to medical treatment than it is in this country.

A word of praise must also be given to the section on the Exanthemata which gives briefly but very clearly the essential points in connexion with the diagnosis and clinical course of infectious diseases of children. The book concludes with practical directions as to diseases and accidents requiring surgical procedures.

We can heartily congratulate the authors on their work. Although containing little that is novel it is so well arranged, clearly written, and devoid of padding as to form one of the best books for the use of the student and the practitioner.

The Throat and Nose and their Diseases. With 550 Illustrations in Colour, mostly designed and executed by the author, LENNOX BROWNE, F.R.C.S. Edin., Senior Surgeon to the Central London Throat, Nose, and Ear Hospital, with special assistance as follows:—Anatomy: MAYO COLLIER, M.S. Lond., F.R.C.S. Eng.; Nervous Diseases: JAMES CAGNEY, M.D.R.U.I.; and Histopathology: WYATT WINGRAVE, M.R.C.S. Eng., Assistant Surgeon and Pathologist to the Central London Throat, Nose, and Ear Hospital. Fifth edition, revised and rewritten. London: Baillière, Tindall, and Cox. 1899. Large 8vo. Pp. xxxii. and 968. Price 31*s.* 6*d.* net.

IT might be thought that little need be said on the appearance of a fifth edition of a work which first saw the light more than 21 years ago, but there are several features in the present issue which certainly deserve to be mentioned. The book itself has grown in volume in spite of the expenditure of much care to keep it within its former dimensions. One feature of this edition is the presence of "special assistance" from various writers on certain subjects. Thus the chapters on the Anatomy of the Larynx, of the Pharynx and Fauces, and of the Nose have been revised by Mr. Mayo Collier; the chapter on Nervous Diseases of the Larynx has been written by the late Dr. James Cagney; and the sections on the Normal and Pathological Histology have been contributed by Mr. Wyatt Wingrave. These are useful additions and materially increase the value of the work. The whole work has been

carefully revised and is fully abreast of the knowledge of to-day There are 417 illustrations in the text and these are all printed in coloured ink; this is distinctly an advantage in the diagrams representing microscopic sections, as a clearer idea is given of the object, but we fail to see the utility of the colouration in the diagrams which only represent instruments. There are 15 coloured plates representing chiefly diseases of the pharynx and larynx. These are hinged and can be opened out so as to lie beside the book during the perusal of the whole of the chapter descriptive of the disease illustrated. These and the other illustrations are deserving of praise.

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HAY'S INVALID FRUMENTINE.
(HAY'S FLOUR MILLS, GROSVENOR-STREET, HULL.)

As we have previously pointed out, this food is prepared on correct dietetic lines, since care is taken in its preparation not to eliminate valuable food principles, proteids, carbohydrates, and mineral constituents, but rather to retain them as far as possible in a digestible condition. The preparation has recently been further improved. By careful cooking and treatment with active malt the carbohydrates, and doubtless the proteids also, have been reduced to an increased digestible state. The preparation affords a very palatable and nourishing food.

VIBRONA MALT.
(FLETCHER, FLETCHER AND CO., 469, HOLLOWAY-ROAD, N.)

According to our experiments this is an active fluid preparation of malt containing in each fluid ounce 10 grains of cinchona in the form of neutral hydrobromate. We found the preparation to be exceedingly active in digesting starch emulsion. The taste of the malt, which is pleasant, appears to mask the bitterness of the cinchona compounds. According to its composition this preparation should possess distinct tonic as well as nutrient qualities. It should be useful where the tonic properties of cinchona bark are indicated for children. As is now well known cinchona in the form of hydrobromate avoids "cinchonism."

ELIXIR PHOSHORI (HORN).
(O. E. HORN, "GLENDOWER," BOURNEMOUTH.)

This is an aromatic syrupy liquid which is said to contain one-fiftieth of a grain of pure free phosphorus per drachm. It is miscible with water and compatible also with certain iron and quinine preparations. From the results obtained on extraction with carbon disulphide we are able to confirm the statement that the phosphorus occurs in the pure elementary state of the yellow variety. We note that it is stated on the label that the contents of the bottle must be used only for dispensing prescriptions of medical men. Phosphorus is a well-known nervine tonic and the solution under analysis is doubtless well suited for its administration. It is said also that phosphorus is useful in preventing the falling off of hair. In any case it should not be administered indiscriminately but rather with caution.

MOUILLA LIQUID SOAP (TEREBENATED).
(S. MAW, SON, AND THOMPSON, 7 TO 12, ALDERSGATE-STREET, E.C.)

Liquid soap is extremely convenient to use. A few drops placed on the palm of the hand with a little water yield almost instantly on rubbing a pleasant and agreeable lather. It is powerfully cleansing and without injurious effect upon the skin as long as there is no alkaline excess. There is no alkaline excess in Mouilla liquid soap according to our experiments. We should like to see the use of liquid soap more extended in the practice of medical men, since it should afford an excellent vehicle for antiseptics. Thus it should be compatible with the solution of iodide of mercury in potassium iodide, the compound forming a very powerful and convenient antiseptic. Potash soap gives the impression of being a more powerful detergent than soda soap. It cleanses the hands more rapidly and leaves a pleasant, cleanly feeling.

DIABETIC CAKE.
(J. GABOR AND CO., 94, WALWORTH-ROAD, S.E., AND 2, TIDY-STREET, BRIGHTON.)

The composition of this cake is based on well-known lines in accordance with the requirements of diabetic patients. It contains a minimum of starch or other carbohydrates. It is prepared from almond flour, the flavour being "nutty." The cake is somewhat heavy and greasy, the smell of the oil present suggesting cocoanut. While it is true that this cake is practically free from starch and on that account is adapted for the diabetic patient we doubt whether it is easily digestible.

THE LANCET.

LONDON: SATURDAY, MARCH 4, 1899.

WE publish this week the result of an exhaustive inquiry which we have made into plumbers' work in its relation to water-supply and sewage disposal in rural districts. This report is supplementary to the Report on the Relative Efficiency and Cost of Plumbers' Work which we published on July 4th, 1896, and no one can read it without feeling how absolutely necessary it is for the safety of the community that the plumber should belong to a body known to possess a certain standard of knowledge.

The memorial recently presented to the Government praying them to deal with the registration of plumbers in the present session points out that while the proper qualification of medical officers of health and of sanitary inspectors has been provided for under the Public Health (London) Act, 1891, the qualification of the men whose intricate work they have to control, and upon the due execution of which so much depends, is left to chance. The memorial is signed by over [illegible] Members of Parliament, including many names of high repute. Another memorial has been sent to the Local Government Board signed on behalf of the Parliamentary Bills Committee of the British Medical Association, the Manchester and Salford Sanitary Association, the Royal Institute of British Architects, the National Health Society, the Royal Institute of Public Health, and the National Association of Master Plumbers of Great Britain and Ireland. Yet another memorial has been presented to Mr. Chaplin on the same subject signed by the mayor, the sheriffs, and the Bishop of Lincoln and by all the public, medical, and sanitary officials of that city with others interested in the question. This list of memorialists surely shows that many of those best able to judge of the matter are convinced of the necessity for additional legislation.

The evil that has to be combated is hydra-headed; deaths from diseases directly or indirectly attributable to defective sanitary surroundings and polluted water-supplies are numbered by thousands annually, and yet represent but a small proportion of the suffering arising from such causes. The plumber, the man who dominates that unseen world in which for our good or evil his works lie concealed in many a tortuous fold, is the man who must be educated and controlled. While we should welcome with satisfaction any measure to ensure a higher standard of technical and practical ability in the operative plumber, registration touches but the fringe of the question and this alone will not suppress the evils arising from defective work. We are apt to forget that while great advances in intelligence and education have been made by all classes during the past generation (the plumber not excepted) human nature is, and some think always will be, much where it was. Regrettable as it may be, an improvement in conscientiousness has not synchronised with the advance of education. Something more than a knowledge of right is required, and the wrong-doer must be coerced. The spirit of the times, the rage for cheapness (call it necessity or avarice, the result i the same); this it is that rules the market. Though it is satisfactory to know that men exist in plenty who would scorn to execute work at the behest of an employer knowing it to be faulty in conception or base in practice, yet there are many who would entertain no such scruple. It is not so much in the houses of the opulent and of the middle-class that defective work is flagrant (though many of these are in evil plight), as it is in the crowded town and suburban dwellings of the labouring classes and of the poor. Into these tenements, which spring up in a night like mushrooms the country through, swarm a half-cared-for population before the water used in the construction of their homes has evaporated from the plaster and bricks. It is here, where the plumber's work is sublet at from £5 to £10 per house, that every evil is rampant. How will registration alone touch the callous men who prostitute their abilities to do such work as this? The question is not one of the better class of plumbers and of those interested in their work desiring registration. Of course they desire registration, but the new legislation is not needed in their behalf. It is the public who require protection, not only from ignorance but from fraud.

To accomplish this should be the object of a short Act the broad provisions of which we may indicate without having the appearance of meddling with matters without our scope:—

(1) The men must be examined and registered by a competent board of examiners and afterwards granted an annual license.

(2) The holder of the license must be made directly responsible for his acts to the local sanitary authorities in whose district he is at the time working and his number must be registered in connexion with each individual house. It would be the business of the local authorities to report any dereliction of duty to the governing board. The board would, as they might see fit, mark or suspend the license.

(3) The vested interests of all existing plumbers would, of course, be respected, but all should be licensed, though in their case registration need not be compulsory. They must also be made responsible to the local sanitary authorities.

Some such measure would, we venture to think, in a comparatively short time greatly improve the standard of the work executed. It would not only insure the householder against the results of ignorance and incompetency, but it would to some extent eliminate fraud, under which inferior material or defective construction is substituted for sound work by the unscrupulous employer in order to enable him to undersell his more conscientious competitor. Its chances of becoming law, provided the Bill were promoted by the Government, are excellent. Each of the private Bills promoted by the Company of Plumbers was read a second time and each received the support of members of all shades of opinion in the House, so that the movement is neither a controversial one nor one that need be made from a party standpoint. It was rather apathy than opposition that blighted the early promise of a useful future presented by these private Bills and the apathy is at the first glance difficult to understand. It might be thought that the increased security which the Bills offered, or sought to offer, to the public would have been

acceptable, at any rate in principle, to all Members of Parliament. Yet no one seemed to care about the registration of plumbers or to think it necessary to urge the measures upon the attention of the House. Why? Curious as the reason may sound, we believe fear of ridicule to have played its part in this neglect of an important matter. There is a certain atmosphere surrounding the plumber which prevents him from being taken seriously, unless indeed calamity ensues from his operations—the "something immejit" of Mr. ANSTEY'S excellent story. To be very earnest about a subject which others find comic requires considerable courage. But such courage should not be wanting. The subject is not comic. It is serious, deadly serious, in its public health aspects, and we hope that the current session will see it treated with the gravity and earnestness which it merits.

THE recently issued report of the Departmental Committee appointed to inquire into the manufacture and use of water-gas and other gases containing a large proportion of carbonic oxide is of considerable medical interest. Water-gas, a mixture of hydrogen and carbonic oxide produced by passing steam through heated coke or anthracite, is an odourless and non-illuminant gas. For public lighting purposes it is "carburetted"—that is, enriched by hydrocarbons derived from oil. The resulting carburetted water-gas smells much like coal-gas; its candle power is greater; owing mainly to the small amount of labour required in its preparation it is on the whole cheaper to make than coal-gas; and it has the additional advantage of possessing what the Committee call an "emergency" value. Unexpected increase in the demand for gas, as by continued fogs, can at once be met by rapid gas manufacture, whereas with coal-gas it is necessary to draw upon storage.

In many large towns of America carburetted water-gas now forms the whole, or nearly the whole, of the municipal gas-supply. In Great Britain a gas-supply consisting solely of carburetted water-gas so far has been provided only in a few localities and for limited periods. But carburetted water-gas is often employed for mixing with coal-gas. A half-and-half mixture, for instance, is ordinarily used at Tottenham and Edmonton; gas at Birkenhead has occasionally contained as much as 64 per cent., and gas in the northern part of London usually contains some 33 per cent. of carburetted water-gas.

The danger of carburetted water-gas lies in its containing about 30 per cent. of carbonic oxide, which in coal-gas is present to between 4 and 12 per cent. only. In considering this danger the Departmental Committee put on one side all questions of injury to health from constant exposure to small leakages of gas of either sort. For illness thus produced apparently, in their opinion, carbonic oxide is not responsible. They "do not think that the existence of anything like chronic poisoning by carbonic oxide has been established." Hence their inquiry has virtually been limited to considering what is the proportion of carbonic oxide which may be allowed in an illuminating gas consistently with reasonable security against fatal result when the gas has been inhaled in relatively large quantities, as, for instance, when a gas-burner has been accidentally turned "full on" in a sleeping-room. The danger from this sort of accident when all the gas is carburetted water-gas cannot be regarded lightly in view of the evidence accumulated in this report. Dr. HALDANE, one of the Committee, points out that in the case of Boston, where 90 per cent. of the gas is water-gas, about one in every 300 deaths is due to accidental poisoning by water-gas. And in this country during the short time that carburetted water-gas was supplied pure in a certain district two persons were killed and five were made seriously ill. Moreover, the Committee insist, very rightly, upon the risk that this gas might become a ready instrument of suicide and homicide. "The facility with which murder (particularly child-murder) bearing all the appearance of accident, could be committed by simply turning on in a small room a jet of gas containing a large proportion of carbonic oxide, seems to us to afford an additional reason for restricting the use of carburetted water-gas."

The most important of the recommendations of the Committee, to which they urge that effect should be given by Act of Parliament, consists in their advocacy of a statutory limit of 12 per cent. of carbonic oxide in any illuminating gas. In special local circumstances of pressure and the like, however, they consider that a maximum limit of 20 per cent., which would permit a mixture of equal volumes of coal-gas and water-gas, might be allowed. As the danger is principally to persons when asleep they point out that these statutory limits need only be imposed in the case of gas supplied at night.

The limits suggested have been arrived at in consideration of a valuable series of experiments by Dr. HALDANE upon the proportions of carbonic oxide in the air of rooms into which coal-gas escapes. The basis of his experiments is the assumption that no serious danger to man arises from several hours' inhalation of air containing carbonic oxide in less proportion than 0·2 per cent., and, which by the way is much more certain, that a proportion between 0·2 and 0·4 per cent. is dangerous to life, while over 0·4 per cent. may cause death rapidly. The amount of escaping gas being constant and the cubic capacity of the room experimented upon being known the question whether or not with a gas containing a known proportion of carbonic oxide the dangerous percentages will be reached becomes one of the ventilation provided. There are, however, few reliable data as to the frequency with which the air of an ordinary "stuffy" bedroom is changed. Dr. HALDANE'S experiments add materially to our knowledge on the point. It is interesting to find that his results are in accord with those of PETTENKOFER in the worst case which has to be considered in this connexion—that of a small room with door, windows, and all other openings closed. A much larger amount of air often passes through such a room than at first would seem possible. In a completely closed room of 1000 cubic feet, for example, Dr. HALDANE estimates that the maximum time needed for the entry of a volume of air equal to that of the room is less than two and a half hours. It must, however, be remembered that diffusion of air in this way through walls, floors, and ceiling is directly dependent upon the difference of temperature between the air of the room and the air outside. As providential diffusion of this sort cannot always be reckoned

on to come to the aid of persons exposed to poisoning by gas the Committee have, we think, done well to advise the restriction of carbonic oxide in ordinary gas-supplies to proportions which are not likely often to do serious harm even when escape takes place into a room which is practically unventilated.

THE effect of Mr. BALFOUR'S London Government Bill on medical officers of health in London will be to add to their labours and responsibilities. They will be directly concerned in the administration of the law relating to dairies, cowsheds, milkshops, slaughter-houses, and knackers' yards, to say nothing of the law relating to noxious trades and common lodging-houses. Thus they will be placed in a position similar to that of the medical officers of health of other urban authorities, except that cowsheds, slaughter-houses, and knackers' yards will not be licensed by the suggested municipalities but by the London County Council. The business of a slaughterer of cattle and all noxious trades when established anew will require the sanction of the County Council as heretofore and not that of the new authorities, and all regulations and by-laws will still be made by the County Council. This is, we think, a wise division of duty and one which should work for uniformity of procedure. Perhaps a more irksome duty will devolve on the County Council than before, for they are to be held responsible for the sufficiency of action of the several authorities in respect of their new duties by being given power of supervision over a defaulting authority. It is obviously much easier to institute the necessary proceedings against a careless cowkeeper or butcher than to persuade or coerce an authority which has its own views to take the necessary proceedings. In short the work of the medical officers of health of the district authorities will be added to and the anxieties of the medical officer of health of the county of London are increased under the Bill.

The proposed changes, however, are obviously in the right direction, although a strong case can be made out for the desire of the County Council to retain the administration of the common lodging-houses until provision has been made for the annual licence of such premises by the Council. This power has already been given to local authorities in Scotland under the recent Public Health (Scotland) Act and is certainly more necessary in London than in Scotch towns. While the duties of medical officers of health in London districts will be thus increased in many districts the area for which they are appointed will be added to. The 45 districts in London will probably be thus reduced to some 30, and this increase in responsibility and work should not be lost sight of. London especially needs capable and zealous medical officers. If there is failure on the part of the officer of a district authority in the provinces that district is probably the only sufferer, but if there is such failure on the part of the officer of a London district neighbouring districts may also suffer, whatever may be the vigilance of the officers of the County Council. There is urgent need that London should have good medical officers, and the only way in which this can be assured is by the payment of salaries adequate to secure men of sufficient ability and influence. We earnestly hope that this point will be considered in any appointments which are made as the result of the passin of the London Government Bill.

We are not now concerned in considering whether the districts to be constituted under the Bill will be of convenient size for the purposes of sanitary administration, although we note with some surprise that the Bill suggests that they may have populations as large as 400,000 inhabitants. There are other points in the Bill to which we may have to refer later, but on the whole we consider that it is a measure in the right direction, although it obviously provides only partially for the changes which must inevitably be effected in the future.

Annotations.

"Ne quid nimis."

INCIPIENT INSANITY.

THE satisfactory treatment of patients suffering from incipient insanity or of those in whom the diagnosis is doubtful is rendered difficult owing to the Lunacy Laws as now framed. In the first place, the medical man hesitates to sign the certificate if there is the least doubt about the patient's condition and, secondly, the friends of the patient object to removal to a recognised asylum unless there is some very obvious reason why home treatment is undesirable. There unfortunately exists an idea that some stigma attaches to the certification of a patient as insane and the general public cannot be brought to understand that insanity is the misfortune and not the fault of the affected person, and that the conditon if suitably treated may end in recovery. Like any other disease the prognosis is more favourable if special medical advice be sought when the malady is at an early stage, but too frequently this course is postponed owing to the reasons stated above until the patient has fallen into confirmed insanity. A joint committee of the British Medical Association and the Medico-Psychological Association has drawn up a draft clause for providing temporary care of persons suffering from incipient or unconfirmed mental disease, and the following is the text of that clause:—

DRAFT CLAUSE.

1. Where a medical practitioner certifies that a person is suffering from mental disease but that the disease is not confirmed, and that it is expedient with a view to his recovery that the patient should be placed under the care of the person whose name and address are stated in the certificate for the period also therein stated not exceeding six months, then during that period the provisions of Section cccxv. of the Lunacy Act, 1890, shall not apply.

2. A medical practitioner who signs such certificate shall within three days after signing the same send a copy thereof to the Commissioners and it shall be lawful for any Commissioner to visit the patient. The person under whose care the patient is placed shall not be the person who signs the certificate.

3. The person who receives a patient under such certificate shall within 10 days after the expiration of the period mentioned in the certificate, or if he ceases to have the care of the patient under the certificate at an earlier date then within 10 days after such earlier date, send a report to the Commissioners stating whether the patient recovered, and if not, in what manner he was dealt with when the person making the report ceased to have the care of him under the certificate.

The committee also drew up a form of certificate as follows:—

CERTIFICATE.

I [*insert full name and address*] a duly registered medical

practitioner certify that [*insert name, address, and description of patient*] is afflicted [*state the nature of the disease*], but that the disease is not confirmed, and that I consider that it is expedient with a view to his [*or her*] recovery that he [*or she*] should be placed under the care of [*insert full name and description*] at [*insert full address of the place where the patient is to be received*] for a temporary residence for a period of [*specify a period not exceeding six months*] from the ..... day of ..... 18...

Dated ..... Signed .....

A deputation representing the joint committee were received by the Lord Chancellor on Feb. 22nd. The views of the committee were expressed by the chairman (Dr. Rayner), by Dr. Blandford, and by Dr. Savage. The Lord Chancellor evidently attached much importance to the representations made to him and left the impression by his reply that he was not indisposed to initiate legislation in the direction desired, though he took exception to the period of probation, six months, as being too long. The committee will have the thanks of the whole profession if as the result of their labours the much needed reform is effected. Similar provisions have been in force in Scotland for 30 years and experience has proved them to work advantageously.

SANITARY AUTHORITIES AND THE INSPECTION OF PREMISES.

AN important decision was recently given in the Queen's Bench Division of the High Court having reference to the powers of sanitary authorities to enter upon premises within their district to ascertain whether they are in a sanitary condition. A duly authorised inspector of the St. Pancras Vestry attended at the North London Collegiate School for the purpose of entering and examining as to the existence therein of any nuisance and admission was refused. An application was then made to Mr. Plowden, stipendiary magistrate, for an order. This was refused on the ground that in point of law there was no evidence of reasonable ground for such entry. The St. Pancras Vestry appealed against the decision. Mr. Justice Lawrance, with whom Mr. Justice Channell concurred, in delivering judgment, said that the magistrate had a right to ask, "Why do you want to go in?" and the mere reply that "I wish to go in because the statute gives me power to go in" is not a reasonable ground. Under the circumstances the magistrate was perfectly justified in refusing the right to enter. According to this ruling it is obvious that medical officers of health and sanitary inspectors have no right to enter any premises, save with the consent of the occupier, to examine as to the existence of any nuisance unless they have reasonable grounds for suspecting the existence of a nuisance, and that the magistrate is the sole judge of what constitutes a "reasonable ground." It is probable also that any officer entering premises for the purpose of inspection without first obtaining the permission of the occupier is liable to an action for trespass. This decision will be far-reaching in its effects as it has hitherto been assumed that sanitary officials had the necessary power of entry for inspection purposes. The present condition is most anomalous. Medical officers of health and inspectors of nuisances are in duty bound to make periodical systematic inspections of their districts and yet they have no legal right enabling them to do this. The practical effects of the decision remain to be seen but may not be so serious as at first sight they appear. Entry, when requested in a respectful manner, is very rarely refused and many officials have never yet been refused. It will, however, no longer be safe to assume that the power of entry exists, and permission should be asked and obtained in all cases, whether it is desired to enter a mansion or the humblest dwelling. As a medical officer has no right to enter a school to examine for a nuisance it is very probable that he has still less right to enter a school to examine the scholars. In certain cases such "rights" are desirable and in any amendment of the Public Health Acts an attempt should be made to secure the requisite powers for making these inspections.

"EMBALMED" MEAT IN THE AMERICAN ARMY.

THE "embalmed" beef question has of late been a disturbing factor in political, army, and medical circles in the United States. For some considerable time murmurs of discontent have been heard regarding the state of some of the canned meat sent out to Cuba, Porto Rico, and Manila as food for the American soldiers in those places. Matters, however, might not perhaps have come to a head had it not been that General Miles who is, under the President, at the head of the army and who commanded the United States expedition against Porto Rico, gave to the lay journals his opinions on the subject i the following strong terms: "In addition to the reports of the regimental commanders I have a great mass of evidence, consisting of communications, affidavits, &c., from officers, soldiers, and civilians. Every part of the country has contributed to the mass of correspondence which I have received in reference to the beef served to our soldiers and the evidence is all corroborative of what I have said. The great publicity which the press has given to the matter has brought all the correspondence of which I speak unto me. I have overwhelming evidence that the embalmed beef was treated with chemicals in order to preserve it. I have affidavits from men who saw the beef undergoing the treatment or embalming process. Now, as to the canned roast beef, that was different from the embalmed beef. The canned roast beef was the beef after the extract had been boiled out of it. You have seen the advertisements, 'Beef extract—one pound contains the substance of from four to five pounds of prime beef.' Well, this is the beef after the extract has been taken from it. They put this beef pulp up in cans and label it 'canned roast beef.' The soldiers report that the canned beef was nauseating. If swallowed it could not be kept on the stomach. I have no interest to serve but the army and the country. When I found that it was the chemicals in the beef that had made the soldiers sick then I ordered an investigation and reports to be sent in. So widespread is the evil that all the reports are not in yet. They are overwhelmingly of the same character—all showing that the beef had been embalmed or was otherwise unfit for men or dogs. Half a million pounds of this beef came in one ship to Porto Rico. The soldiers were 50 miles away in the mountains. The beef was so bad that it would have caused a pestilence had it been taken ashore from the ship. So it had to be thrown overboard. What else could be done with it? Nothing alive could eat it." Owing to General Miles's plain speaking the Government ordered an investigation of the matter to be made, but the testimony offered has been of so conflicting a nature that no very definite result has been arrived at. It should be said that it is claimed that boric and salicylic acids were the chemicals used to preserve the meat. Naturally, the medical journals of America have been devoting a good deal of their space to a consideration of the subject and the *New York Medical Record* in its issue of Feb. 4th has this to say with regard to the use of chemicals as preservatives of meat: "Worse than all, however, was the unwarrantable experiment of adding chemicals in the shape of boracic and salicylic acids to prevent decomposition. The overwhelming testimony of such as used the 'embalmed' beef is to the effect that it was offensive to the sight, smell, and taste, was to the last degree unappetising and unwholesome, and that in very many instances it produced much of the digestive troubles which so largely prevailed among the soldiers.

This latter state of affairs can be easily explained by the ingestion of the toxins of decomposing animal food on the one hand and the constant admixture of chemical products with the food in question on the other. As there is no proof to show that boracic and salicylic acids are absolute preservatives it is fair to presume that the 'embalmed' beef was not only more or less decomposed but was artificially 'doctored' besides. Thus the two conditions were combined to make the men sick." From the very commencement of camp life much dissatisfaction has been expressed by the United States volunteer with the quality of the food supplied to him. No doubt this prejudice was largely due to the fact that he was in most instances "a green hand" and not inured to campaigning hardships, but with regard to the canned beef proof has clearly been afforded that a large proportion of it was unfit for human food—whether owing to defective packing or to the use of chemicals will, it seems, never be demonstrated to the satisfaction of the general public. At least, however, the investigation will do good to the extent of opening the eyes of the American people to the fact that adulteration of some kind is practised by the big preserved meat packers and such a sentiment will be aroused against the principle that these men will be compelled in their own interest to amend their ways and to supply wholesome canned meat.

DEATHS UNDER ANÆSTHETICS.

A DEATH under ether occurred at the Paddington Infirmary on Jan. 30th. The patient was a well-developed and well-nourished man, aged 51 years. For the last three years he appears to have had attacks of *petit mal;* his lungs were emphysematous, but otherwise he was healthy. Ether was given from a Clover's inhaler with a view to the performance of an operation for the relief of urethral stricture. Methylated ether of the specific gravity of 0·720 was used. No struggling or unusual symptoms occurred—we are told by Mr. Sidney Vines, to whose courtesy we are indebted for careful notes of the case—during the period of administration. The breathing was somewhat shallow but never laboured and in four minutes when complete anæsthesia was present the respiratory rhythm was normal. At this time the colour was good, the pulse was regular, the pupils were moderately dilated and reacting to light, but the conjunctival reflex was abolished. The indicator of the inhaler was then standing at "3," and was turned to midway between "3" and "2," and the patient was pronounced ready for operation. Suddenly, and before the surgeon had commenced, the pulse intermitted, a few irregular, feeble beats occurred, and it then ceased, respiration grew shallow, and the patient's face became cyanosed. The pupils remained of medium size and the ocular globes were fixed. A distinct inspiratory effort was made after cessation of the pulse. Restorative measures, although promptly adopted, failed to effect resuscitation. This is a case of peculiar interest, as the phenomena described are most unusual under ether, as indeed is the termination. The administration seems to have been conducted in the most careful and accurate manner, so that the death was certainly not the result of overdose, insufficient aeration of the lungs, or failure of circulation from strain imposed upon the heart by muscular spasm. It is possible that the syncope was the result of a fit such as the patient was in the habit of having, possibly brought on by the excitement and trepidation incident to facing an operation under an anæsthetic—a first experience. Such seizures occur even under profound narcosis but do not necessarily result in fatal syncope in all cases. It is unfortunate that no post-mortem examination was made, as the condition of the viscera and especially of the brain and kidneys would have somewhat guided the clinician in his classification of so unusual a case of death under ether. A death under chloroform occurred recently at the Metropolitan Hospital. The patient was a man, aged 37 years, suffering from strangulation and gangrene of the intestine due to a volvulus. He was given chloroform by a house physician with a view to operation but he died under the anæsthetic. We have not been favoured with any particulars as to the method employed or as to the phenomena of the induction, but we gather that the man was probably *in extremis* at the time the chloroform was employed. In conditions of such grave collapse it is usual to employ ether or the A.C.E. mixture but why the choice fell upon chloroform we have no means of judging. A death, also under chloroform, is stated to have occurred at the Royal South Hants Infirmary on Feb. 2nd. The patient, a man, aged 33 years, suffered from an abscess affecting the chest wall and sub-sternal tissues. This was opened under chloroform, but as recovery was not satisfactory a further operation was judged to be necessary. When chloroform was given (? method) the man struggled, became rigid, and ceased to breathe. At the inquest it was stated that death probably resulted from pressure of the matted tissues upon the vagus. Unless the facts are very much distorted—which can hardly be the case, as we understand that the report is fairly accurate—the cause of death was the usual one in such cases—an overdose of chloroform taken during the period of struggling. The vagus nerve has so many functions that it must be always a factor in death, but it is very seldom that mechanical and slowly exerted pressure leads to more than alteration of the cardiac rhythm. No doubt dragging upon the vagus during dissecting operations about the sterno-mastoid region does produce a marked degree of inhibition, but not, we believe, rigidity with respiratory paralysis. These are practically always the result of poisoning of the medullary centres by a too concentrated vapour of chloroform inhaled sometimes in a single deep inspiration such as commonly occurs after a prolonged period of holding the breath while struggling. All methods such as pouring unmeasured quantities of chloroform upon any surface from which it is inhaled lead to such overdosage as the administrator has no power to limit or to prevent at the critical moment, save that of removing the cloth or other "apparatus" from the patient's face, and this is unhappily seldom done until the fatal overdose has been inhaled.

THE SAFEGUARDING OF THE NILE.

OBJECTION of a more or less sentimental character was taken to the statement by Mr. Brodrick in the House of Commons that the body of the Mahdi had been thrown into the Nile but none of the honourable Members present seem to have noticed the highly important signification of the act when regarded from a sanitary point of view. With the alleged desecration we are not specially concerned but the preservation of the waters of the historical river from organic pollution is a matter which cannot but prove of interest to all hygienists. Unlike other countries Egypt is entirely dependent on the Nile for its supply of drinking-water. There are no springs or wells properly so-called to be found from one end to the other of the immensely long groove which the great stream has worn for itself on its way through the Libyan desert to the Mediterranean. Wells or shafts for water certainly do exist, some of them of a considerable depth, but all without a single exception are fed by the Nile and would speedily run dry were the bed of the river to be diverted. It is therefore of the utmost importance that the wholesomeness of the Nile water should be religiously maintained. Of course the amount of contamination produced by one human body could only be insignificant, but it would be a truly serious calamity if the people of Egypt were

to get hold of the idea that in the eyes of the executive the purity of the river was a matter of little or no consequence. Already the tendency to dispose of putrescible material by casting it into the stream is far too common. If the fellah were not afraid of contravening the sanitary notions of his exotic rulers the Nile would very soon be converted into a general sewer. That it partook of this character not so very long ago is, we believe, an undoubted fact, but of late years under British impulsion a good deal in the way of purification has been accomplished. The task no doubt is full of difficulty, involving as it does a radical change in the habits and customs of an entire nation, but if it is to be carried to a successful issue the hands of the sanitary officials should be strengthened and not weakened. Since the foregoing was written we have learned that, notwithstanding the statement in Parliament, there are still considerable doubts regarding the actual disposal of the false prophet's remains. According to a morning contemporary[1] Mr. Brodrick was not quite accurate in stating that the body of the Mahdi was thrown into the river. The tomb at Omdurman was no doubt opened, but the skull and some of the bones are at present in the possession of officers who took part in the campaign. A portion of the coffin, too, has been preserved as a memento of the overthrow of Mahdist tyranny in the Soudan. It is sincerely to be hoped that this is the true story. That Lord Kitchener with his training as a Royal Engineer could ever under any circumstances have given orders for a dead body to be thrown into the Nile was, on the face of it, well-nigh incredible from the first.

THE MORTALITY FROM DRINK.

DR. WILLIAM CARTER of Liverpool has been delivering a public lecture on drink in which he draws attention to several points. Amongst others, arguing from the returns of the Registrar-General, he shows that the deaths directly attributed to intemperance in 1896 were 91 per 1,000,000 among males and 52 per 1,000,000 among females, these rates being considerably in excess of the mean rates in the 10 years immediately preceding. We are constantly assured by politicians that drunkenness is diminishing. Dr. Carter says: "Year by year almost without a single break in its cruel and pitiless progression the mortality from drunkenness has been, and is, increasing, and it shows what is worse than all and what should arouse the national conscience, or if the conscience is dead or asleep should rouse the nation to a sense of its imminent danger—viz., that the deaths are increasing among women far more rapidly and in a far greater ratio than among men." He gives particulars to show that whereas in the years 1876–80 38·4 deaths from the direct effects of alcohol occurred in every 1,000,000 people living, in the years 1891–95 68 such deaths occurred, an increase of 80 per cent. n the last period over the first, reached steadily and progressively through the years of the intervening period. Perhaps the most important part of Dr. Carter's address is that in which he shows the much greater rate of increase of mortality from drink among women than among men, so that whereas the proportionate increase of deaths from this cause among men has been 42 per cent. up to 1895, that among women has been more than 100 per cent. This is brought out very strikingly in the case of the deaths not returned as alcoholic, but which medical men know to be mainly such in their causation—in particular, cirrhosis. The increase of deaths from this cause is in the case of males in the last 30 years at the rate of 300 per cent. and in the case of females at practically 400 per cent. Dr. Carter refers very eloquently to his investigations with Sir Henry Littlejohn and to the classical investigations of Dr. Parkes and Dr. Sanderson into the sanitary condition of Liverpool. Dr. Carter is puzzled, as all medical men must be, with the comparative indifference with which mortality of this sort is regarded by the public and by sanitary authorities as compared with mortality from infectious and notifiable disease. The deaths of 22·4 persons per 1,000,000 from typhus fever from 1877 to 1881 inclusive stirred the sanitarians and the public and more stringent sanitary legislation was procured with the result that the mortality from typhus fever has fallen in 1896 to two per 1,000,000. In the same period 43·3 per 1,000,000 died directly from alcohol, to say nothing of indirect mortality. We hear no such protest from sanitarians and the mortality goes up to 91. It is a hopeful sign when physicians of Dr. Carter's standing, with a great medical experience of life in such a city as Liverpool, give prominence to such grave facts. Whether such drunkenness is cause or effect may be matter for argument. It coincides with an enormous expenditure on sanitary improvements and an equal improvement in the social and economic conditions of the people and ought to receive the immediate attention of the nation.

[1] The Morning Post, Feb. 21st, 1899.

"THE TUBERCULOSIS PROBLEM IN THE UNITED STATES."

THERE is much that is interesting in a paper with the above title in the *North American Review* for February by Dr. J. A. Knoff. With the greater part of his remarks we agree, but with others we cannot concur. For instance, he states that consumption "is the disease which the power of man could cause to disappear from the world with more certainty than any other." We believe that most medical authorities would consider small-pox, typhus fever, and rabies far more preventable than tuberculosis, although by suitable precautions the death-rate from tuberculosis could be lowered even more than at present is the case. Dr. Knoff not only expresses the opinion as to the possibilities of diminishing tuberculosis, but also proposes a scheme by which he thinks a great deal could be done towards that very desirable end. He says: "Just as there exists in nearly all States or municipalities a commission or a number of special examiners for the purpose of determining who is a proper subject for State care in an asylum for the insane, so should there exist a commission for the determination of admission to a municipal or State institution for consumptives." Dr. Knoff enters into considerable detail as to the carrying out of such a scheme. He suggests that a committee should be formed consisting of physicians and laymen for the following purposes: to determine the applicant's condition by a medical examination; to visit his home if he has been found tuberculous and to institute such hygienic measures as seem necessary; and to examine the other members of the family in order to find out if any of them have also contracted the disease and, if so, to counsel proper treatment. Then follows a very drastic proposal—to report in full to the sanitary authorities concerning the condition of the patient's dwelling and suggesting its renovation or even destruction when it is evident that tuberculosis has become "endemic" there owing to the condition of the soil or to other sanitary defects. We doubt whether any sanitary authorities would ever consent to such extreme measures even if they could be proved necessary. A house might be deemed insanitary owing to the condition of the drainage, but to insist on its demolition would require a stronger authority than a committee formed on the lines which Dr. Knoff proposes. Finally, a suggestion is made which would be sure to meet with such strong opposition that its adoption would be almost hopeless—the committee is to determine the financial condition, whether the patient is or is not able to pay and whether or not by his being taken to an institution the family will become destitute. "If the latter should be the case it would become

an imperative duty for the municipality to provide for the family." Considering the enormous prevalence of tuberculosis among those entirely unable to pay for the prolonged treatment necessary, such a scheme can only be considered to be utopian. With another part of Dr. Knoff's paper we most strongly agree. He says: "In reality, pulmonary tuberculosis is not a contagious disease, the contact *per se*, the touch of the invalid, is not capable of transmitting the disease; it is the ignorant, unclean, or helpless patient who by his mode of disposing of his expectorations endangers the life of others. ..... Thus it is more correct to call pulmonary tuberculosis only a highly communicable disease and we repeat, from living or coming in contact with a clean, conscientious, tuberculous invalid, nothing whatever is to be feared." Such words are likely to have a considerable influence in calming the unnecessary alarm which has arisen in lay minds as a consequence of classing "consumption" amongst "infectious diseases."

PARALYSIS OF THE SOFT PALATE FOLLOWING NON-DIPHTHERITIC SORE-THROAT.

Is paralysis of the soft palate following sore-throat a proof that the disease was diphtheria? Most clinicians would probably say yes. But analogies which prevail among the infectious diseases, and the occasional occurrence of what is a common complication of one as a very rare one of another, ought to raise some doubt. Multiple neuritis may occur in many diseases and may not the palatal paralysis of diphtheria, which is probably a local effect of the diphtheritic toxin, be produced by other toxins? The following case, brought before the Société Médicale des Hôpitaux by Professor Carrière, is of great importance and appears to be quite conclusive. A woman, aged 20 years, was seen on the third day of an illness which was attended with rigors and pain in the back. The temperature was 100·2° F., the face was pale, and the cervical glands were enlarged. The uvula, the soft palate, the fauces, and the tonsils were covered with greyish-white, adherent false membrane which penetrated into the tonsillar crypt. The mucous membrane beneath was bright red and hæmorrhagic in places. Cultures were made repeatedly and they showed only streptococci and staphylococci. In spite of energetic local treatment the membranes were rapidly reproduced. Improvement began on the sixth day; the throat was red and free from membranes on the seventh. The glandular enlargement lasted for about 15 days. On the twenty-seventh day the patient noticed that her voice was nasal. There was total paralysis of the soft palate. Under faradaisation recovery took place in about three weeks.

THE CORPORATION OF HASTINGS AND THE HASTINGS DRINKING-WATER.

THREE or four weeks ago the town clerk of Hastings, instructed by the Water Committee, wrote to the local paper to say that all the water supplied to the borough had been analysed and was "chemically of high quality." The analysis was not given and one of the ratepayers asked to see it, promising not to publish it without permission. He was informed, no other reasons being given, that "it has not been the practice to furnish individual ratepayers with details of the analyses from time to time made of the water supplied to the borough and that the committee cannot see their way to make an exception in your favour." The ratepayer replied that if desired he would pay for the information, for it was but natural that he should wish to know what he was drinking and that the mere assurance of the corporation that the water was good for him personally was not quite sufficient. He also pointed out that he had not promised to refrain from publishing any analysis which he himself might make and that if the corporation persisted in secrecy he was afraid people would draw their own inferences. Two men then called at his house and took away a sample of the water and a few days afterwards he received a letter from the town clerk telling him that the Water Committee "had nothing to add to previous communications." The Hastings Corporation can hardly expect that all its constituents will consent to be treated like children and will swallow in perfect confidence what it pours down their throats. Of course, as the ratepayer said, conclusions will be drawn and if they are unjustly unfavourable the corporation alone is to blame. The phrases "not been the practice" and "nothing to add" show, as has often been observed before, that the provincial Tite Barnacle is much more official than his brother at Whitehall.

THE LEAGUE OF MERCY.

WITH the Prince of Wales as President and the Princess of Wales as Lady President a League of Mercy has been formed for the purpose of promoting the welfare and furthering the objects of the Prince of Wales's Hospital Fund for London. A special object of the league is to encourage personal service in promoting the adequate maintenance of hospitals and an "Order of Mercy" has been established which will be conferred as a reward for gratuitous personal services in this direction. We hail the foundation of the league as yet another proof of the Prince of Wales's broad sympathy and no less of his sagacity, while we note with particular pleasure that the services to be rewarded must be personal.

THE SMOKE NUISANCE.

WE have received an advance copy of the prospectus of the Coal Smoke Abatement Society. Its President is Sir William Richmond, its secretary Mr. Owen B. Thomas, and its treasurer Dr. Des Vœux, while the offices are for the present at 59, Chancery-lane. We are glad to see that such a society has been formed, for we have done our best for some time past to rouse the sanitary authorities to take action and to incite magistrates to convict in cases where the feeble defence of "No Welsh coal" was put forward. Besides the strict enforcement of the existing laws against black smoke there should be another passed making it illegal for any house to be built in future without being fitted with proper smoke-consuming appliances. We may mention that the annual subscription to the society is 5*s*., but subscribers may give more if they like.

THE PRESENTATION OF THE FREEDOM OF THE CITY OF LONDON TO SIR HUGH OWEN, G.C.B.

THE ceremony of admitting Sir Hugh Owen to the Freedom of the City of London upon his retirement from the position of Permanent Secretary to the Local Government Board, the duties of which he has so long and so ably fulfilled, took place in the Guildhall Council Chamber on Feb. 24th. The Master of the Worshipful Company of Plumbers (Mr. Alderman Hind) occupied the chair, for with obvious fitness it was as a liveryman of the Plumbers' Company that Sir Hugh Owen was admitted to the Freedom of the City. In addition to the wardens and a special court of the company the Master was supported by the Lord Mayor and Sheriffs, Mr. Chaplin (President of the Local Government Board), the Earl of Onslow, Earl Fortescue, Lord Welby, Sir Richard Webster, G.C.M.G. (the Attorney-General), Mr. McKinnon Wood (Chairman of the London County Council), and a large and influential gathering of Members of Paliament and representatives of Government municipal departments more or less intimately

associated with Sir Hugh Owen in his work. The Lord Mayor on behalf of the citizens welcomed the new Freeman while Mr. Chaplin on behalf of his department bore personal testimony to the excellent work done by Sir Hugh Owen and to his many sterling qualities. Mr. McKinnon Wood, as representing "Greater London," referred to the enormous and ever-increasing amount of work carried out by the department over which Sir Hugh Owen was the acting chief, the amount of which work the public generally had no means of appreciating. The simple ceremony of taking the oath and signing the roll having been gone through, Sir Hugh Owen in returning thanks spoke of the interest taken by the Plumbers' Company not only in the craft which they represented but in questions of public health.

MUNICIPAL BACTERIOLOGY.

FOLLOWING the announcement in our issue of Feb. 18th that the vestry of St. Giles had made arrangements for the bacteriological examination of suspected cases of typhoid fever and diphtheria we now have pleasure in noting that the board of works for the district of Poplar and Bromley has decided as an experiment for two months to supply diagnosis boxes, sterilised, to medical practitioners for use in suspected cases and to submit the same when charged to bacteriological examination. This excellent innovation is due to the energy of the medical officer of health, Mr. F. W. Alexander, and we sincerely hope that at the end of the two months the arrangement will be found to be worthy of being made permanent.

THE GENERAL MEDICAL COUNCIL.

THERE has been considerable activity in the offices of the General Medical Council during the last week. The committee appointed to watch legislation on the subject of midwives and its agreement with the views of the Council sat on Saturday last. On Monday the usual meeting of the Executive Committee in the interval of the sessions of the Council was held, and on Tuesday the first meeting of the Penal Committee since the November meeting of the Council took place. The premises of the Council are in the hands of builders who in accordance with the resolution of the Council in December are adding to the height of the building and providing additional rooms which are much needed.

THE new laboratories in connexion with the Middlesex Hospital Medical School are now completed and are equipped with all the best modern appliances for the purpose of instruction and original research. An inaugural conversazione will be held on the evening of March 15th in the new buildings when many objects of interest will be exhibited.

THE council of the Medical Society of London, on the recommendation of a special committee, have awarded the Fothergillian gold medal for 1899 to Dr. S. Monckton Copeman "in recognition of his researches on the preservative effects of glycerine upon vaccine lymph and of the benefits in a practical sense that have arisen therefrom."

WE understand that Sir Samuel Wilks is not likely to offer himself for re-election as President of the Royal College of Physicians of London at the meeting to be held on March 27th.

THE St. Patrick's Festival Dinner of the Irish Medical Schools' and Graduates' Association will this year be held on Saturday, March 18th, at 7.15 P.M., at the Café Monico, Piccadilly-circus, the President, Sir William Thomson of Dublin, in the chair. The association will have the honour of entertaining as the guest of the evening a distinguished Irishman—General Sir George White, V.C., G.C.B., G.C.S.I., G.C.I.E., the Quartermaster-General and late Commander-in-Chief in India. As a large attendance is anticipated members should make early application for dinner tickets to the honorary secretary, Mr. P. J. Freyer, 46, Harley-street, W.

MR. WALTER FRANK RAPHAEL WELDON, M.A., F.R.S., late Fellow of St. John's College, Cambridge, and Professor of Zoology at University College, London, has been elected Linacre Professor of Comparative Anatomy at Oxford in place of Professor Ray Lankester, resigned.

AT the annual meeting of the Royal Medical and Chirurgical Society held at the rooms of the society on Wednesday last, March 1st, Mr. Bryant was re-elected President.

PROFESSOR RAY LANKESTER, the Director of the Natural History Museum (British Museum), has been elected a Correspondent of the French Academy of Sciences.

LORD LISTER has been made a Correspondent of the Paris Academy of Medicine.

THE ROYAL COMMISSION ON THE METROPOLITAN WATER-SUPPLY.

THE fifty-fourth sitting of the Royal Commissioners was held at the Guildhall, Westminster, on Feb. 21st. The Commissioners present were the Chairman (Lord Llandaff), the Right Hon. John William Mellor, Sir John Dorington, Mr. de Bock Porter, Mr. Robert Lewis, and Major-General Scott.

The examination of Mr. HARRY WILKINS, secretary to the Lambeth Waterworks Company, occupied the whole of the sitting. The witness contradicted some statements with regard to financial matters which had been made by Mr. Gomme, a witness who had given evidence on behalf of the London County Council. In the course of the evidence some information was given with regard to the water-supply of Croydon. It may be remembered that part of Croydon is supplied both by the municipal waterworks and by the Lambeth Company. A case occurred in which the new owner of a house had preferred to have the water supplied by the corporation. The charges made by the corporation of Croydon for their water-supply were formerly less than those made by the Lambeth Company and complaints had at that time been made with regard to the quality of the water supplied by the Company. The witness ascribed these complaints to the fact that they charged more for water than was charged by the corporation; they therefore reduced their prices in the year 1894 and since that time they had not had a single complaint of the inferior quality of the water which they supplied. At the present time, the witness stated, the people of Croydon were charged the same price by the Lambeth Company and by the Croydon Corporation.

In answer to Mr. DE BOCK PORTER the witness said that they had not lowered their charges in Croydon because of the competition but because of the allegations as to the quality of the water which they supplied. If it got abroad that the quality of their water was inferior they would suffer a very heavy loss and it answered their purpose to come down to the Croydon charges in order to disprove that allegation.

The CHAIRMAN asked the witness whether the charges made at Croydon were sufficient to make a profit on the water which they supplied there. The witness replied that "whether they did or did not was immaterial."

In answer to Sir JOHN DORINGTON the witness said that last year one of their customers had withdrawn his custom from the company and taken the supply of the Croydon corporation. He stated also that a medical man at Croydon had recommended one of his patients to take the Lambeth water in preference to that supplied from the chalk well of

Croydon. This patient was suffering either from gout or from some rheumatic affection.

The CHAIRMAN asked whether all the medical men of Croydon were sending patients to drink the Lambeth company's water as they would those of Kissingen or Aix. The witness replied that the water did not possess medicinal qualities.

With regard to the failure of the water-supply which had taken place in the Balham district at the end of June, 1897, the witness said that the failure was due to the sudden blocking of some of their filter beds with "fish spawn," but as far as he could ascertain no house at Balham was without water for a whole day. The pressure of the supplies had been lowered in consequence of the large amount of water which was being drawn off for the purpose of road washing. The blocking of the filter beds commenced on Saturday afternoon and a full supply of water was resumed by the following Thursday. The average daily supply on these days exceeded the average for the whole year. The witness said that this was the only failure of supply of which they had been guilty. With regard to the evidence given by Dr. Randell concerning the supply at Beckenham, the witness said that a short supply was given in the year 1897 from one Sunday to the following Thursday at the time when the filter-beds were blocked. The witness said that when Dr. Randell spoke about there being not a drop of water anywhere it was a gross exaggeration.

Some evidence was given with regard to the charges made for hydrants which were placed in the grounds of schools. Under the licensing arrangements of the London County Council no entertainment can be given on premises which are not provided with hydrants, and the CHAIRMAN pointed out that the London County Council very properly declined to authorise the assembling of crowds on premises which were not provided with the means of extinguishing fire. The witness said that the charge made for these hydrants was three guineas a year and that this sum included the use of water.

In answer to Mr. LEWIS the witness said that the connexions were made at the expense of the school or of the householder. The annual payment of three guineas included the use of water for fire extinction and for fire extinction drill as well. The Poor Law Schools have a dry drill and a wet drill. They put a hose on the hydrant and direct it to the top of the building so that the water goes over the house and into the drains on the other side, and no charge is made for the water so used.

Sir JOHN DORINGTON pointed out that according to the regulations of the company the water was to be used only in case of any fire upon the premises. The witness said that they did not adhere to that rule and that no charge was ever made beyond the fixed annual rent of three guineas.

In answer to the CHAIRMAN the witness said that the company which he represented objected to sell their business, but should purchase be decided upon they would oppose any special arbitration clauses. Their objections were as follows:—

(1) The Lands Clauses Consolidation Act has been in force for half a century and has proved satisfactory in working under the most adverse circumstances and its operation and procedure are well understood; (2) the object and probable effect of the special arbitration clause put forward by the London County Council are to diminish the amount of compensation which the company might reasonably expect under an arbitration conducted under the ordinary law of the land; (3) a special arbitration would be speculative and while it might inflate the compensation, would be more likely to diminish it, either result would be unjust and unsatisfactory; (4) having regard to the statutory precedent of a special arbitration clause above referred to, an arbitrator would probably construe such a clause adversely to the company; (5) it may be added that even if the company were to be deprived of part of the compensation to which they would be entitled under the existing law, it by no means follows that purchase would be financially advantageous to the purchaser, because if the administration were conducted on political and not on business lines, the cost of management would considerably exceed the present cost and the profit would be proportionately reduced.

The CHAIRMAN asked the witness to explain what he meant by suggesting that the administration might be conducted on political lines. The witness replied that it was a matter of common notoriety that the London County Council had been captured by the Labour Party and that a good deal of their administrative work was done on what might be called political lines. The witness did not think that a specially appointed Board would be open to this objection. Hitherto the objection which he had mentioned had not applied to any ordinary corporation. It applied to the London County Council more than to other corporations because the London County Council had fallen—had succumbed—to the temptation and other corporations had not. It was a frail member of the sisterhood. The witness wished to say this without offensiveness to the London County Council, but he stated it as a very painful fact. He spoke rather in sorrow than in anger, but very much in sorrow.

In answer to the CHAIRMAN the witness said that at the present time a very large quantity of the shares of the company were held in joint accounts. He could not tell exactly what amount was held by trustees because the company did not recognise trustees and they were not required to do so under the Company's Acts. The witness thought that nearly half the shares were held in joint accounts.

With regard to the future sources of supply the witness said that the company hoped to be able to obtain 10,000,000 gallons of water from wells. They were now sinking a well at Selhurst and if that experiment proved satisfactory they would sink wells elsewhere. They hoped to obtain leave to take 50,000,000 gallons from the Thames.

Major-General SCOTT pointed out that this was double the amount that the company were now authorised to abstract from the river.

In answer to Mr. BALFOUR BROWNE, Q.C., who appeared on behalf of the London County Council, the witness said that he contended that in case of purchase the company ought to receive what an arbitrator under the Land Clauses Act would award. In the year 1891 he gave evidence on behalf of the Vestries' Bill when Mr. Balfour Browne appeared for the Lambeth Company. At that time the witness was clerk of the vestry of St. James and in that representative capacity he had put the following resolutions:—

1. That in view of the fact that the effect of the quinquennial revaluation of the metropolis now in progress will be to augment the charge to the consumers for the same supply of water as enjoyed by them at the present time and thereby to increase by a very large sum the value of the property of the water companies the Government be requested forthwith to introduce a Bill to enable the London County Council, or some other properly representative body, to acquire the undertakings of the eight water companies now supplying London, or some of them, by agreement, or failing agreement to create a board of arbitrators to settle the terms of transfer by compulsory power or to give power to establish an independent supply. 2. That as the London County Council has no power to introduce a Bill into Parliament for the purchase of the water companies' undertakings the vestries and district boards represented at this conference be advised (following the precedent successfully set in the case of metropolis gas legislation) to unite in giving notice of and preparing a Bill for such purpose and for power to set up a competing supply.

The bodies which were concerned in the promotion of this Bill were the Vestry of St. James, Wandsworth District Board, Holborn District Board, and Kensington Vestry. St. Margaret's and St. John's, Westminster, were represented in the first stages, but they subsequently withdrew. One of the terms of the Vestries Bill was that:—

In estimating the amount of compensation payable in respect of the undertaking of any company the board of arbitration shall have regard to the value of such undertakings prior to the introduction into Parliament of the Bill for this Act and shall not take into consideration any power possessed or claimed to be possessed by any company under the Waterworks Clauses Act, 1847, or otherwise to make up any deficiency in the dividends of any previous year to the rate prescribed by any special Act of any company or by the said Waterworks Clauses Act, 1847.

The London County Council opposed this Bill and Sir Thomas (now Lord) Farrar wrote a long report opposing it on the ground that it was too liberal to the water companies.

The fifty-fifth sitting of the Royal Commissioners was held at the Guildhall, Westminster, on Feb. 27th. The Chairman (Lord Llandaff) and all the Commissioners were present. The witnesses examined were Mr. Harry Wilkins whose examination was concluded, Mr. Francis Stephen Clayton, Governor of the Chelsea Water Company, and Mr. George Henry Gill, Secretary of that company.

At the commencement of the proceedings Mr. PEMBER, Q.C., on behalf of the Lambeth Waterworks Company, put into evidence a statement of the capital account of that company on March 31st, 1854, as presented to the proprietors. Some time was taken up in a discussion concerning the capital account of the Lambeth Company and of the conflicting statements made by Mr. Gomme of the London County Council and Mr. Harry Wilkins, Secretary to the Lambeth Company.

Mr. DE BOCK PORTER said that what the Commissioners wanted to see was a statement of capital account from 1848

to the present time. After some conversation between the Commissioners and counsel Mr. HARRY WILKINS was recalled. He said that they were dependent for their information on abstracts which had been circulated to their shareholders and that they had not the original books of the company. It was ultimately arranged that Mr. Gomme should meet Mr. Wilkins to see if either could convince the other of the error of his figures.

Mr. FRANCIS STEPHEN CLAYTON, in answer to the CHAIRMAN, gave the history of the Chelsea Company and said that business was commenced in the year 1722, that the company formerly had reservoirs in the Green Park and Hyde Park, and obtained a charter from George I.[1]

In answer to the CHAIRMAN the witness said that there was little vacant ground in the districts supplied by the company. In Fulham at the present time about 400 acres are not built upon but probably in 20 years' time the whole district will be "fully developed" and covered with houses. There was a possibility that the old houses in Chelsea would be pulled down and larger ones put in their places and the trade supplies given by the company were constantly increasing. With these exceptions there was little prospect of any considerable increase in the business of the company. Larger houses had been built in the place of smaller ones during the last few years, especially in the neighbourhood of Sloane-street on the Cadogan estate.

In answer to the CHAIRMAN the witness said that they had power to take 22,000,000 gallons of water from the Thames at West Molesey. They were also allowed in cases of emergency to take water at Seething Wells. At the present time the company only required 17,500,000 gallons daily (they therefore had a margin of 4,500,000 gallons) and there was no immediate probability of any considerable increase in the amount of water which they would be called upon to supply to their customers.

With regard to purchase the witness said in answer to Mr. DE BOCK PORTER that the company would not be satisfied to part with the property on the terms of receiving their present income. He thought that it was fair to look back on the early struggles of the company and that they should have the full benefit of their present profit. If it had not been for the private enterprise of these companies London would have been without water. The witness said he was opposed to purchase by a changing body, because in his experience water company directors during their first year or two of office did not quite understand their duties and if a water authority were subject to popular election as soon as members began to understand their business they might be out of office and a fresh set might take their places. Such a gigantic affair as the metropolitan water-supply if it were taken from the hands of the present owners should be managed by a public authority of permanent character and not by a fluctuating body. The witness thought that possibly a public outcry might be made against water rents of any kind. We have free education, free bridges, we are to have free libraries; why not free water? That, the witness thought, might one day be a popular election cry if the water authority were vested in a popularly elected body.

In answer to Major-General SCOTT the witness said that he was quite willing to submit to the extension of control indicated in the Government Bill which has recently been introduced into Parliament with regard to intercommunication of the companies' mains. With a view to carry out the interchange of water he was quite willing to consent to carry out any such works as the Local Government Board might direct.

In answer to further questions he said that personally he would not object to the same kind of control being applied to the whole undertaking. As the company had a margin of 4,500,000 gallons of water daily it would not be necessary for them to look elsewhere for an additional supply. The company agreed to the system of intercommunication "for the purpose of presenting a united front." It was thought better that all the companies should unite for the purpose and they had done so.

The CHAIRMAN suggested that they thought they must throw something to the wolves. The witness remarked that his lordship was pleased to put it so. Practically the witness said he thought there was at the present time sufficient control in the interests of the consumers. They were looked after by the water examiner, their accounts were examined by the Government auditor, and, moreover, the Metropolis Water Act of 1897 imposed considerable control. The CHAIRMAN remarked that the Commissioners understood that only one case had been brought forward under that Act and that this case had been abandoned. The witness suggested that this seemed to show practically that the Act was not needed.

Mr. MELLOR suggested that the remedy was not a very practical one.

In answer to the CHAIRMAN the witness said that they would have no objection to administrative control by a Government official, a man who was clearly impartial. He would not object to a public inquiry under the Local Government Board to investigate any complaints which might be made.

In answer to Mr. CRIPPS the witness said that he was acquainted with the amount of control at present imposed by those Acts which affected the water companies, and that in his opinion it was not necessary that any further control should be added.

In answer to Major-General SCOTT the witness said that he did not think that local authorities took much interest in the water-supply.

In answer to Sir GEORGE BRUCE the witness said that if there was anything wrong in the cistern of a customer he would send to the nearest turncock.

The CHAIRMAN asked how the turncock could be found and it was suggested that a policeman or even better a postman would usually be able to give the required information.

The CHAIRMAN remarked that he lived in the Chelsea district but he had not the slightest idea where he could find a turncock.

Sir GEORGE BRUCE said that the Chairman had never needed a turncock and Mr. MELLOR said that for his part he had on more than one occasion needed the services of a turncock. The witness explained that the turncock had out-of-door duties and Mr. MELLOR said that he had not seen one for many years in the part of London in which he lived and which happened to be the Chelsea district.

The CHAIRMAN remarked that it appeared that the turncock had to be caught flying, and Mr. PEMBER, Q.C., and Mr. POPE, Q.C., on behalf of some of the water companies, remarked that he was usually to be seen about Christmas time.

Mr. GEORGE HENRY GILL presented to the Commissioners a large number of statements with regard to the affairs of the Chelsea Company. Amongst these was a statement of the works of the company containing a brief account of the reservoirs, filter-beds, pumping-engines, and mains. A table was put in showing the average amount of water supplied daily from the years 1881 to 1898 inclusive and giving other details with regard to supply. It appears from this table that in the year 1881 only 7 per cent. of the houses were in constant supply. In the year 1893 51 per cent. were on constant supply and a constant service was given to all customers during part of the year 1898. In the year 1881 the average amount supplied per head was 34·2 gallons, and during the year 1898 it was 43 gallons. A schedule showing the length of mains and their sizes was given; the largest main is 36 inches in diameter. Tables were given showing the power of the engines and the quantity of water which can be pumped during a day. There was also a schedule of financial details and a statement showing the capital expenditure of the company. There were also statements giving the limits of the area of supply, the estimated population, and the rateable value of property on which water rents are levied.

Mr. GILL explained the statements which he had put in, and in answer to the CHAIRMAN gave it as his opinion that the company supplied water of a high standard of purity, that the vast majority of their customers were satisfied both with the quality of the water and with the quantity which they received, and he thought it was not likely that they would benefit by any changes which might take place if the business was taken from the company and placed under a public authority.

[1] The history of the company has already been given in THE LANCET of March 6th, 1897, p. 684.

THE Universal Food and Cookery Exhibition will open at the Imperial Institute on Tuesday, March 7th, and will close on March 11th. Over 1000 entries have been received for the various sections, competitors being no doubt attracted by the liberal prizes.

Obituary.

SIR JOHN STRUTHERS, M.D., F.R.C.S. EDIN., LL.D. GLASG.,

EMERITUS PROFESSOR OF ANATOMY IN THE UNIVERSITY OF ABERDEEN.

SIR JOHN STRUTHERS died at his residence in Edinburgh on Friday, Feb. 24th. He was born in 1823, at Brucefield, near Dunfermline. He was one of three brothers who, like his own three sons, entered the profession of medicine. Edinburgh then, as now, was the leading medical school of Scotland, but, as Struthers was always fond of saying, the University benefited by the "Colleges," which he always advised young graduates to join. In 1845 he took his M.D. degree. In the same year he became F.R.C.S. Edin., and no doubt his devotion to the Royal College of Surgeons of Edinburgh may be explained by the fact that it was there, after his apprenticeship as demonstrator at the University, that he first felt his power as a teacher of anatomy. He was a keen and persistent dissector. To this as to every other of his pursuits, he gave himself without after-thought. *Quicquid agis, age pro viribus* was an axiom with him. He used to tell with regret how from his devotion to the scalpel he missed one afternoon a great scene in the history of Scotland—the solemn procession of the Disruption which was the beginning of the Free Church of Scotland. But the absorption was characteristic. Even at this early stage he was much more than a lecturer on anatomy. The extra-mural school did not then occupy the proud position of extra-University that it has since achieved, and Struthers was a leader in securing its recognition.

After some 16 years of vigorous teaching and reform in Edinburgh he was appointed in 1863 to the Anatomy chair in Aberdeen University. The University of Aberdeen, as we now know it, made by the fusion of two historic universities, was then only three years old. The medical faculty had its home in Marischal College where some of the class-rooms stood vacant because the "arts" had been transferred to King's College. But there was only one laboratory which was reserved for chemistry. There was a dissecting-room, but in Struthers's opinion it was hopelessly inadequate. Forthwith he asserted, in Senate and in council, the claims of science. In those days the teaching of classics dominated everything. The two great liberalising forces were Professor Bain in arts and Professor Struthers in medicine. Together and singly they fought for reform after reform until to-day the students have almost more than their own and the University adapts itself to every type and variety of man. Struthers by his persistence kept the board of works aware of its obligations to keep the universities in repair. He ultimately got new dissecting-rooms, a new lecture theatre, and a new museum. These, though far from possessing the magnificence of the latest "rooms," ranked as among the best of their time. Attached to the dissecting-rooms was a microscope-room which was an immense innovation. The bone gallery, where in the course of time white bones fell into new orders for the ends of teaching, was not only in itself a well-arranged museum but was also an inviting students' reading-place. The museum was a home of comparative types, the most conspicuous example of which was perhaps the "static procession" of graded skeletons from the minor monkeys, through the higher apes, ourang-outang, and gorilla to man. Nothing could more subtly mould the impressionable mind of the beginner to receive the leading conceptions of comparative anatomy. Partly in the natural order of things, partly—and largely—through the tireless energies of Struthers, the medical school rose steadily in numbers. In a pamphlet published some years ago he records that in 1861–62 the total students of medicine numbered only 160; in 1889–90 (his last year of teaching) they numbered 433. Struthers steadily kept the claims of the school before the general public. The result was that money flowed in, and to-day the medical faculty is assisted by a large number of bursaries, prizes, and at least one good travelling fellowship.

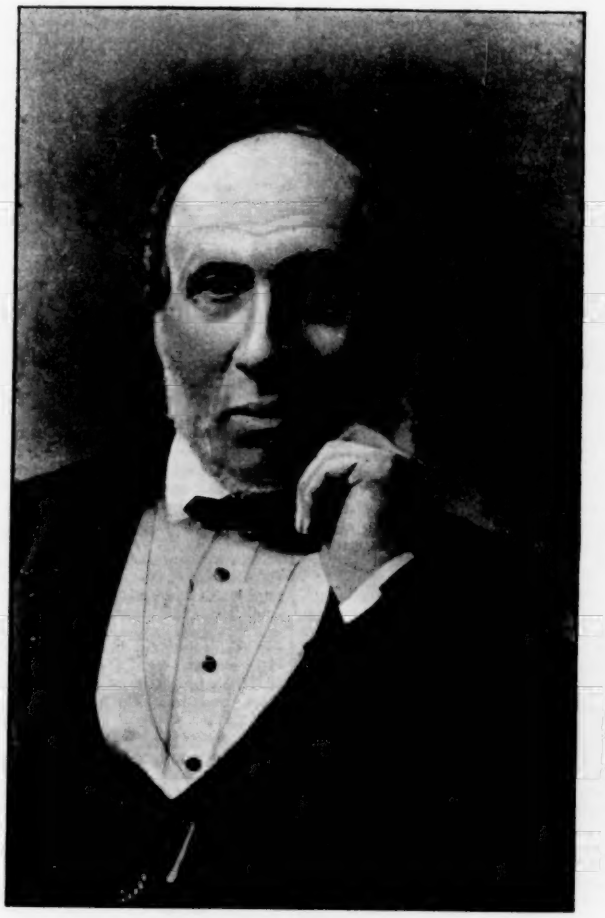
His teaching, both in the dissecting-room and in the lecture-room, was nothing if not objective and demonstrative. He had come through a time when lectures were merely lectures and he set his face against words. The man who did not know his "bones" got no farther forward. He came there to use his own eyes not the eyes of others and use his own eyes he must. In the days of his vigour Professor Struthers was a clear, elegant expositor. To a large extent he used diagrams and blackboard, filling in the outlines as he proceeded. But he put note-taking in the second place. His purpose was to fix in the mind concrete images of things, not verbal descriptions of them. He kept three, if not four, courses running abreast—elementary osteology, general anatomy, regional anatomy, advanced osteology (including comparative), and these had to be verified and supplemented in the dissecting-room. He also had a special course of histology. Like Huxley, he was interested in the "engineering" of the whole animal world. When he went to Aberdeen the "Origin of Species" was only four years old. The new ideas of natural selection, adaptation, and survival were only beginning to affect the few scientific minds that were still young or open. Struthers was open and not yet old. He taught Darwinism as the occasion came and it came often. The "old teleology" came in for many a gentle sarcasm. It is curious how shadowed by theological prejudice physical science seems then to have been; but Struthers, who knew Hugh Miller and the battle he fought, braved the popular opinion and taught to his students what he believed to be the truth.

As in Edinburgh so in Aberdeen Struthers occupied all the time he could in promoting the cause of medical education. He became a member of the Aberdeen Royal Infirmary Board, and at once he urged on the public the necessity for increased hospital accommodation. The fine extensions now in full use owe not a little to his timely forcefulness, and to-day the general public no less than the medical school is the gainer. On his retirement in 1889 he never slackened in the same cause. He became a member of the Edinburgh Infirmary Board and did his powerful best to keep the teaching purposes of the hospital well to the front. It is an open secret that he developed the pathological department immensely. Again, on the Leith Hospital Board he took for years a powerful lead. By urging the exclusion of infectious cases he compelled the local authority to bear its proper burden and lightened the hospital for an increased amount of general medicine and surgery. He succeeded in getting the hospital extended to the necessary dimensions of a good teaching hospital and when the Leith Public Health Hospital at East Pilton was opened two years ago he was there to congratulate the Town Council on the great stride forward.

Meanwhile he had become President of the Royal College of Surgeons of Edinburgh. In 1898 the Queen recognised at once the man and the institution by conferring on him a knighthood. The whole of his pupils and those of the profession who knew him felt that few so well deserved recognition at the hands of the State. Glasgow University had honoured him with the LL.D. degree some years before. His friends had had a fine portrait of him painted by Sir George Reid, P.R.S.A. This beautiful picture now hangs in the new picture gallery of Marischal College. These honours and offices of friendship Sir John Struthers appreciated warmly. But perhaps what touched his heart most was the spontaneous, informal gathering of pupils last July to present him with an address of congratulation on his recent honours.

About a year ago his health began obviously to fail. At the Lister reception in June last his extreme pallor was the remark of everyone. He went on a voyage to Norway, but that was of no avail. He tried the effect of rural scenery, but that also was of no avail. In August or September last he was compelled by weakness to keep his bed. About the middle of February a serious change for the worse came over him and on Feb. 24th after a life of strenuous and unselfish battle for great causes he laid down his arms and passed "to where beyond these voices there is peace."

A member of the General Medical Council writes: "Dr. Struthers, as we all knew him, was a very active member of the Council during the years in which he was a member either for the Joint Universities of Edinburgh and Aberdeen (1883–1886) or for the University of Aberdeen alone (from 1886 to 1891). There was a fighting element in him which found many opportunities of asserting itself. He was always in favour of thoroughness and work in medical education and of such methods of examination as best tested these qualities. He was opposed to the Council appointing surgical examiners to the Apothecaries'



SIR JOHN STRUTHERS, M.D., LL.D.

Society and would have refused such appointments so as to end that corporation in 1887, but was prevented from doing so by a large majority of the Council who thought the society had done good work for the profession since 1858 and that it was somewhat hardly treated by the Royal Colleges under the Act of 1886. His large experience as a teacher in anatomy and his devotion to the work, as well as his native sense and his great knowledge of medical education in Scotland, gave an interest to his speeches in the Council which occasionally, however, were pitched in a tone of superiority which militated against the acceptance of his view. He was for several years chairman of the Education Committee, and in that capacity as well as in that of chairman of the Visitation and Inspection Committees he did very hard and valuable work for which he received the special thanks of the Council in 1891. His love of work, especially of anatomical work, was a passion and continued until illness made it impossible. It infected his pupils and all who came within his influence—a number which included many of the best and most successful members of the profession in and out of Scotland."

CHARLES JOSEPH ARKLE, M.D., F.R.C.P. LOND.,

ASSISTANT PHYSICIAN TO CHARING-CROSS HOSPITAL.

DR. CHARLES ARKLE whose sudden death Charing-cross Hospital has now to deplore, entered at University College as a medical student in 1879. He qualified in 1884 as a Licentiate of the Society of Apothecaries and in the next year gained the Atkinson Morley Surgical Scholarship. He then proceeded to the M.B. London and subsequently filled the posts of house surgeon, house physician, and obstetric assistant in the University College Hospital. In these posts he won not only the cordial approval of the staff but the warm regard of all with whom he worked. Especially was he popular with his fellow residents in the hospital, for he was in a marked degree genial and kindly, one whom it was impossible not to see was the well-wisher of all with whom he had to do. While his successful career on the junior staff warranted the promotion it was in great part owing to his cordial manner and generous disposition that when the post of senior resident medical officer became vacant he was asked to fill it. It was generally recognised that under him the wheels of the hospital management would run very smoothly—a result which many resident medical officers have found it by no means an easy one to secure. The way in which he carried out the duties of the appointment fully justified all anticipations, and when his appointment as teacher of bacteriology at Charing-cross Hospital and assistant physician to the Brompton Hospital for Consumption, although enlarging his sphere of work, pointed to a severance of his connexion with University College it was universally allowed that the loss would be a great one and that upon Dr. Arkle rested a large share of credit for the present efficiency of the medical school.

In the beginning of 1892 the Council of Charing-cross Hospital decided to combine the posts of pathologist to the hospital and curator of the museum, and Dr. C. J. Arkle was appointed to the office thus created. This was his introduction to the Charing-cross Hospital Medical School and his personality soon made itself felt. He was an able and popular pathologist, grasping the main facts of a case readily and expounding them with remarkable lucidity. His more systematic weekly demonstrations were regularly attended by a large number of students. To the museum he devoted much time and attention, but his work in this department was performed in the recesses of the curator's apartments and did not attract so much attention. At the end of 1892 he was appointed teacher of bacteriology and he held this appointment until last year. In 1895 a vacancy occurred on the medical staff of the hospital and Dr. C. J. Arkle was thereupon appointed assistant physician. This involved the resignation of his former appointment, but as joint lecturer on practical medicine and medical tutor he had ample opportunities for the study and teaching of clinical medicine—the kind of work for which he always showed the greatest preference. Two characteristics in his clinical teaching were very marked. One was an excellent knowledge of surgery and the other was that practical faculty of emphasising essential points which has already been referred to in connexion with his work as pathologist. Dr. Arkle was neither a rapid worker nor a quick speaker, and when to his work already mentioned were added the duties of vice-dean at the medical school and assistant physician at the Brompton Hospital it gradually became evident to some of his friends and, indeed, to himself that even his strong physique might suffer, but he decided not to give up his vice-deanship until the expiration of the ordinary term of office. By a strange and sad coincidence this occurred on the day of his death.

Dr. Arkle was a man who had many friends and no enemies. His genial face, kindly, good-natured disposition, and his interests in sports ensured his popularity among the students, while his sound judgment, his uncompromising integrity, and his varied social qualities made him a favourite with all his colleagues at the different institutions with which he was intimately connected. As a football player he was well known, both when he was a student and for some years afterwards. He was a bold and skilful forward at the Rugby Union game and was captain of the United Hospitals Football Club when that club could place a very dangerous combination in the field. He was an ardent mountaineer and for some years past had been in the habit of devoting at least a month each summer to climbing in Switzerland. He was a member of the Alpine Club and had scaled repeatedly most of the usual peaks of the Alps and many not attempted by the ordinary climber.

Dr. Arkle's contributions to medical literature were fairly numerous and whenever he wrote he always had something to say that was worth saying. Among his most important papers are one contributed in conjunction with Dr. Hinds of Worthing to the Pathological Society in 1896 on Pneumonomycosis, one contributed to the *British Medical Journal* upon the Local Anæsthetic Effects of Cocaine, and one contributed to our columns upon a case of Measles occurring during the Course of Typhoid Fever.

The attack of pneumonia to which he succumbed appeared only three days before death, but it rapidly involved a large extent of both lungs and proved fatal.

ROYAL PORTSMOUTH HOSPITAL.

OPENING OF NEW WARDS.

T.R.H. THE DUKE AND DUCHESS OF YORK visited Portsmouth on the afternoon of Feb. 27th in order to open two blocks of the hospital which have been erected at a cost of £16,000 in commemoration of the Queen's Diamond Jubilee and form the first part of a scheme for the entire reconstruction of the building. There are two wards in each block, measuring 87 feet in length, 28 feet in width, and 14 feet six inches in height. They are lighted by 11 windows on either side and each ward is furnished with beds for 20 patients. The flooring is of Terrazo marble and the heating is by Teale's patent stoves, of which there are two in each ward. A separate block for the bathroom and lavatories has been provided at the end of each building, built of glazed bricks with a connecting passage leading into the ward. Gas is used for cooking purposes and the lighting is by electricity. The plans, prepared by Messrs. Young and Hall of Bloomsbury, show that it is intended in the future to build two other blocks similar in construction. This hospital has previously been favoured with the patronage of the Royal Family. The foundation-stone of the original building was laid by the late Prince Consort on Sept. 27th, 1847, and that of the present new blocks by the Duke of Connaught on August 7th, 1897.

The Duke and Duchess of York travelled from London in the morning and after luncheon at Admiralty House drove to the hospital accompanied by Lord Northbrook and Admiral Sir Michael Culme-Seymour and were received by Sir W. D. King (chairman of the Hospital Committee), the Mayor, General Sir F. Fitzwygram, M.P., Sir John Baker, M.P., General Sir Baker Russell (Commanding the Southern District), Admiral Sir H. Chads, the Bishop of Portsmouth. Proceeding to the board room the following members of the medical staff were presented to Their Royal Highnesses: Dr. Ward Cousins, Dr. Lloyd Owen, Mr. H. Rundle, Dr. Wallace, Dr. Watson, and Dr. Ware. A procession was then formed for one of the new wards where the members of the corporation in their robes and leading representative citizens were assembled. The nursing staff of the hospital lined the corridor. After dedicatory prayers said by the Rev. C. E. CROWLEY, chaplain to the hospital,

Sir WILLIAM KING opened the formal proceedings by tracing the history of the hospital and describing its growth and various extensions. He claimed that the new part of the hospital was the most perfect of its kind in the south of England.

The MAYOR in a brief speech observed that the Duke of Connaught, a soldier, laid the foundation-stone and the Duke of York, a sailor, would open the building, which was most gratifying to a naval and military town like Portsmouth.

Sir JOHN BAKER moved a vote of thanks which was seconded by Lord NORTHBROOK on behalf of the county and supported by Dr. WARD COUSINS who spoke on behalf of the medical staff of the hospital and pointed out the immense advantage that a properly constructed hospital was for the cure of the sick and injured, and expressed his conviction that the other two blocks would be built before long.

The Duke of YORK, in reply, said: In the name of the Duchess and for myself I cordially thank the speakers for their kind words and for the vote of thanks. I need not say it has given us both the greatest pleasure to come here to-day to take part in the ceremony of opening this new addition to the Portsmouth Hospital. But it gives me a special pleasure because I come here as the member of the third generation of my family who have been connected with this hospital, as the Prince Consort laid the foundation-stone of the original building and the Duke of Connaught laid the foundation-stone of this building in 1897 in commemoration of the sixtieth year of the Queen's reign. I can only say I congratulate you on the completion of these additions which cannot fail to be of the greatest value to the sick and poor of this community, and I wish to commend this hospital to your care and liberality, feeling sure that it will receive at your hands the same consideration in the future that it has always received in the past. I wish the hospital every success and prosperity and I trust that sufficient money will soon be raised to complete the remaining buildings. I have great pleasure in declaring the new wing of the hospital to be open and at the request of the committee I name the two women's wards "Victoria" and "The Duchess of York" and the two men's wards "Albert" and "Connaught."

Afterwards the Royal party inspected the building and partook of tea. On the Duchess being told that one of the survivors of the *Arno* disaster was a patient in the hospital she asked to be taken to his bedside and there she spoke a few words of sympathy to the poor fellow who was deeply touched by the fact that Royalty showed an interest in his welfare.

VITAL STATISTICS.

HEALTH OF ENGLISH TOWNS.

IN 33 of the largest English towns 6900 births and 4505 deaths were registered during the week ending Feb. 25th. The annual rate of mortality in these towns which had been 21·9 and 19·5 per 1000 in the two preceding weeks rose again last week to 20·6. In London the rate was 21·5 per 1000, while it averaged 20·0 in the 32 provincial towns. The lowest rates in these towns were 13·8 in Burnley, 14·1 in Leicester, 15·3 in Portsmouth and in West Ham, and 15·4 in Bristol; the highest rates were 23·3 in Sunderland, 25·8 in Manchester, 26·7 in Liverpool, and 32·0 in Blackburn. The 4505 deaths in these towns included 363 which were referred to the principal zymotic diseases, against 403 and 340 in the two preceding weeks; of these, 100 resulted from diphtheria, 97 from whooping-cough, 69 from measles, 44 from "fever" (principally enteric), 29 from diarrhœa, and 24 from scarlet fever. No death from any of these diseases was recorded last week in Plymouth; in the other towns they caused the lowest death-rates in Leicester, Preston, Huddersfield, and Halifax, and the highest rates in Swansea, Wolverhampton, Birkenhead, and Blackburn. The greatest mortality from measles occurred in West Ham, Bolton, and Manchester; from whooping-cough in Bradford, Birkenhead, and Sunderland; and from "fever" in Wolverhampton and Blackburn. The mortality from scarlet fever showed no marked excess in any of the large towns. The 100 deaths from diphtheria included 29 in London, 12 in Leeds, 11 in Swansea, 9 in Sheffield, 6 in Liverpool, 5 in Blackburn, 4 in West Ham, and 4 in Birmingham. No fatal case of small-pox was registered last week either in London or in any other of the 33 large towns; and two small-pox patients were under treatment in the Metropolitan Asylums Hospitals. The number of scarlet-fever patients in these hospitals and in the London Fever Hospital at the end of last week was 25·75, against numbers declining from 2939 to 2587 on the eight preceding Saturdays; 241 new cases were admitted during the week, against 265, 253, and 202 in the three preceding weeks. The deaths referred to diseases of the respiratory organs in London, which had been 481 and 413 in the two preceding weeks, rose again last week to 484, but were 50 below the average. The causes of 59, or 1·3 per cent., of the deaths in the 33 towns were not certified either by a registered medical practitioner or by a coroner. All the causes of death were duly certified in West Ham, Bristol, Nottingham, Newcastle-upon-Tyne, and in 11 other smaller towns; the largest proportions of uncertified deaths were registered in Wolverhampton, Preston, Sheffield, and Hull.

HEALTH OF SCOTCH TOWNS.

The annual rate of mortality in the eight Scotch towns, which had been 31·2 and 28·0 per 1000 in the two preceding weeks, further declined to 24·1 during the week ending Feb. 25th, but exceeded by 3·5 per 1000 the mean rate during the same period in the 33 large English towns. The rates in the eight Scotch towns ranged from 16·0 in Dundee and 21·9 in Aberdeen to 26·8 in Edinburgh and 29·0 in Greenock. The 737 deaths in these towns included 23 which were referred to whooping-cough, 19 to measles, eight to diarrhœa, five to scarlet fever, five to diphtheria, and four to "fever." In all, 64 deaths resulted from these principal zymotic diseases, against 101 and 76 in the two preceding weeks. These 64 deaths were equal to an annual rate of 2·1 per 1000, which was 0·4 above the mean rate last week from the same diseases in the 33 large English towns. The fatal cases of whooping-cough, which had declined from 43 to 31 in the three preceding weeks, further fell to 23 last week, of which 10 occurred in Edinburgh and nine in Glasgow. The deaths referred to measles, which had been 22 and nine in the two preceding weeks, rose again to 19 last week, of which nine were recorded in Aberdeen, seven in Glasgow, and three in Edinburgh. The five fatal cases of diphtheria exceeded by one the number in the preceding week, and included two in Glasgow. The deaths from scarlet fever, which had been six and 11 in the two preceding weeks, declined to five last week, of which three occurred in Glasgow. The four fatal cases of "fever" showed a further decline from recent weekly numbers and included two in Edinburgh. The deaths referred to diseases of the respiratory organs in these towns, which had been 346 and 285 in the two preceding weeks, further fell to 233 last week, but exceeded by 116 the number in the corresponding period of last year. The cause of 34, or nearly 5 per cent., of the deaths in these eight towns last week were not certified.

HEALTH OF DUBLIN.

The death-rate in Dublin, which had declined in the three preceding weeks from 31·8 to 27·3 per 1000, rose again to 30·3 during the week ending Feb. 25th. During the past four weeks the rate of mortality in the city has averaged 30·3 per 1000, the rate during the same period being 20·8 in London and 26·8 in Edinburgh. The 203 deaths registered in Dublin during the week under notice showed an increase of 20 upon the number in the preceding week, and included 12 which were referred to the principal zymotic diseases, against eight in each of the two preceding weeks; of these, four resulted from "fever," three from scarlet fever, three from diarrhœa, and two from whooping-cough, but not one either from small-pox, measles, or diphtheria. These 12 deaths were equal to an annual rate of 1·8 per 1000, the zymotic death-rate during the same period being 1·7 in London and 3·0 in Edinburgh. The deaths referred to different forms of "fever," which had been four and two in the two preceding weeks, rose again to four last week. The three fatal cases of scarlet fever exceeded the number recorded in any week since November last. The deaths from whooping-cough, which had been two and four in the two preceding weeks, declined again to two last week. The 203 deaths in Dublin last week included 38 of infants under one year of age and 52 of persons aged upwards of 60 years; the deaths of infants showed an increase, while those of

elderly persons were below those recorded in the preceding week. Three inquest cases and three deaths from violence were registered; and 76, or more than a third, of the deaths occurred in public institutions. The causes of 14, or nearly 6 per cent., of the deaths in the city last week were not certified.

THE SERVICES.

ROYAL NAVY MEDICAL SERVICE.

THE following appointments are notified:—Staff Surgeon W. J. Colbourne to the *Boscawen*, for the *Agincourt*. Surgeons: H. C. Whiteside to the *Boscawen* for the *Dolphin*; S. D. T. Halliday to the *St. Vincent*, for the *Martin*; J. M. G. Swainson to the *Boscawen*, for the *Seaflower*; A. A. Forrester to the *Boscawen*, for the *Wanderer*; W. G. Westcott to the *Lion*, for the *Liberty*; F. J. McKenna to the *Impregnable*, for the *Nautilus*; J. A. Moon to the *Boscawen*; G. B. Brown to the *Sharpshooter*; H. L. Norris, W. W. Keir, P. H. Bannister, H. W. M. Rees, and H. C. Gardner to the *Victory*, for disposal; C. Shepherd, J. Stoddart, E. C. Sawdy, and M. W. Falkner to the *Vivid*, for disposal; J. A. Forrest and R. S. Osborne to the *Wildfire*, for disposal; J. K. Raymond and F. R. Mann to the *Pembroke*, additional, for disposal; and H. Huskisson to the *Cambridge*.

ROYAL ARMY MEDICAL CORPS.

Lieutenant-Colonel J. A. Clery joins at Woolwich. Major C. E. Nichol is posted to the Station Hospital, Western Heights, Dover, for duty. Major Faunce is held in readiness to embark for Malta. Lieutenant R. E. G. Phillips joins at Woolwich and holds himself in readiness for service in India.

INDIA AND THE INDIAN MEDICAL SERVICES.

Captain J. O. Pinto (Madras) is appointed to officiate as Civil Surgeon of Amraoti until further orders. Captain C. G. Spencer, R.A.M.C., and Lieutenant H. J. Walton (Bengal) are placed on special duty under the Government of India in the Home Department. Lieutenant-Colonel T. Grainger, Officiating Civil Surgeon of Champaran, is appointed to act as Civil Surgeon of Darbhanga. The appointment of Major J. Shearer, D.S.O., Bengal Establishment, 27th (Punjab) Regiment of Bengal Infantry, to be Secretary to the Principal Medical Officer, Her Majesty's Forces in India, is confirmed.

THE HEALTH OF THE NAVY.

We have already alluded in a summary way to the results embodied in the recently published Statistical Report of the Health of the Navy in 1897 by Sir Henry Norbury, K.C.B., the Director-General of the Royal Naval Medical Service. These results are, speaking generally, very satisfactory. They show that progressive improvement has been taking place of late years and that during the year under review it has not only been maintained but that, as compared with the previous year, and, still more, as compared with the average of the previous 10 years, the aggregate number of cases of disease and injury during 1897 exhibit a decreased ratio per 1000, and that as regards the death-rate that for 1897 is below that of any year since 1856 when the reports first appeared in their present form. The most unfavourable returns are from the West Coast of Africa and are mainly attributable to the Benin Expedition which gave rise to an increased amount of invaliding. The surgeon of the *St. George*, Surgeon Frank H. A. Clayton, gives an excellent article descriptive of the Benin Expedition and of remittent fever, of which his ship had a severe experience—viz., 456 cases. He speaks highly of the value of antipyrin in the initial stage of the fever. The medical officer of the *Widgeon*, Surgeon Charles S. Facey, speaks of the fever on board that ship as of a very severe type. The hæmatozoon of Laveran was found in many of the cases of malarial fever which were under treatment; pigmented spherical bodies were the forms most frequently seen and, in addition to these, crescentic bodies occurred in a few patients but always associated with the spherical variety; amœboid movement was visible in all of them. There is a brief but interesting note in connexion with the *Indefatigable* on the West Indian Station about three cases of poisoning by the manchineel tree—in one case giving rise to vesication of the mouth, lips, and tongue from biting the fruit, and in the cases of two officers to an acute form of ophthalmia from standing under the tree in a shower of rain. The text and figures dealing with Mediterranean fever (newly introduced into the nomenclature) and enteric fever prevalent at Malta and Phalerum Bay are interesting and the whole report for 1897 is well worth reading.

THE ANNUAL REPORT ON ARMY RECRUITING.

The medical profession take an interest in common with the rest of the nation in the maintenance of the army and one of the duties of army medical officers brings them a good deal into active connexion with the subject of recruiting. We may therefore briefly allude to some of the results embodied in the annual report of the Inspector-General of Recruiting just issued. The return shows that the total number of recruits enlisted for the regular army during 1898 was 40,729; with the exception of the year 1892, during which 41,659 were raised, this is the largest number of recruits in any year since the introduction of short service. There was a net increase of 9980 men during the year. This increase was not, however, entirely due to recruiting, special inducements having been offered to reservists to rejoin the colours, of which 4479 men availed themselves. A large augmentation in the establishment of the Army was, it will be remembered, authorised during the past year. Although the whole of this increase was included in the Estimates for 1898-99 it was decided that the augmentation should be carried out gradually and spread over a series of years and this is now being done. During the past year an important and, as we think, salutary change was also made in the pay of soldiers and increased facilities for obtaining employment in civil life have been afforded to soldiers after leaving the colours. It is too early yet to feel confident of the continued success of these beneficial measures, but the results so far seem to be very promising.

WHITAKER'S NAVAL AND MILITARY DIRECTORY AND INDIAN ARMY LIST, 1899.

As a *multum in parvo* encyclopædia of the names of officers of the three sister services the present issue of this handbook would be hard to beat. For purposes of reference an alphabetical list of officers employed under the Union Jack and the Royal Standard is frequently of great convenience to all those who have anything to do with either or all of the services, and Whitaker's is the only list of the kind with which we are acquainted. The addition of the Indian Army list is a special feature of the present volume and greatly enhances its value.

THE LATE INDIAN FRONTIER CAMPAIGN.

From the official statistics called for in Parliament by Major Rasch showing the extent of in efficiency among the troops during the Indian frontier campaign of 1897-98 attributable to the results of venereal disease, it appears that the total number rejected, because they were disqualified for field service on that account, was 989 and that 492 were incapacitated during the campaign for the same reason.

DEATHS IN THE SERVICES.

Lieutenant-Colonel Poole Robert Gabbett, R.A.M.C., at Southsea, on Feb. 27th. He entered the Army in 1871 and became Surgeon in 1873. Ten years later he attained the rank of Surgeon-Major and reached that of Lieutenant-Colonel in 1891 and of Brigade-Surgeon-Lieutenant-Colonel in 1895. Until recently he was Principal Medical Officer, Barbadoes.

QUEEN CHARLOTTE'S LYING-IN HOSPITAL.—The Earl of Hardwicke presided at the annual meeting of governors of this hospital on Feb. 27th. The report stated that during the year 1112 patients had been delivered in the hospital and 1070 at their own homes. The expenditure had amounted to £4123 11*s.* 11*d.* and the ordinary income to £3501 17*s.* 1*d.* The Prince of Wales's Fund had made a grant of £300 to the hospital and £50 to the convalescent home. The enlargement of the hospital was nearing completion and the new nurses' home would be opened about midsummer. The chairman, in moving the adoption of the report and accounts, made an urgent appeal for contributions towards the £7000 still needed for the works at the hospital and the new nurses' home.

Correspondence.

"Audi alteram partem."

MEDICAL CONTRACT WORK IN THE COUNTY OF DURHAM.

To the Editors of THE LANCET.

SIRS,—In the county of Durham we are in the midst of a struggle to obtain a higher rate of pay from the miners of the collieries; in some parts we have succeeded beyond expectation, some are wavering, and some are in direct opposition to the change. With patience and gentle forbearance we shall get all to agree to the increase. Our present danger is from those of our own profession who may step in and accept the old terms. I ask for your powerful aid in preventing any such occurrence. Members of the Medical Union are working shoulder to shoulder and will stoutly resist the invasion of strangers, and those of our number who may suffer loss from temporary suspension of pay will be assisted by their more fortunate brethren.

I am, Sirs, yours faithfully,

EDWARD JEPSON,

Durham, Feb. 27th, 1899. President of the Durham Medical Union.

*** Our correspondent will find that we have on more than one occasion urged upon the profession the necessity of supporting one another in this movement and similar movements. We trust that no medical man will be so blind to the interests of the profession which he has joined (and therefore in the long run to his own interests) as to accept lower terms from the miners of Durham than those which the present members of the Durham Medical Union are justly asking.—ED. L.

YERSIN'S PLAGUE SERUM.

To the Editors of THE LANCET.

SIRS,—In THE LANCET of Jan. 21st your special correspondent in India states in connexion with my evidence before the Indian Plague Commission that I "had nothing conclusive to say from personal experience" as to the value of Yersin's serum. Will you allow me to state that, on the contrary, I was able from personal experience to give a very definite opinion as to the value of this form of treatment in plague? That conclusion was, I regret to say, unfavourable to the claims of the serum. It was based upon a carefully conducted trial in which 50 cases of plague were submitted to the serum treatment and 50 other cases in the wards at the same time were noted as control cases. As the mortality in each group of cases was the same (80 per cent.) and as there was no perceptible effect whatever upon any of the symptoms I was forced to the conclusion that Yersin's serum is an entirely indifferent substance in the treatment of plague without influence for good or evil upon the course of the disease. I hope shortly to publish notes of the cases.

I am, Sirs, yours faithfully,

Calcutta, Feb. 9th, 1899. FRANK G. CLEMOW.

"REGINA *v.* REICHARDT."

To the Editors of THE LANCET.

SIRS,—If Mr. Sers will turn to the Lunacy Acts he will see that a lunatic is defined as an idiot or a person of unsound mind, and that medical certificates of insanity must state that the person affected is a lunatic, an idiot, or a person of unsound mind. The Scottish Acts, however, permit in addition the use of the term "an insane person." There is therefore no need to differentiate between the phrases "temporary unsoundness of mind" and "temporary insanity." It is of no importance from a legal point of view. Delirium tremens and the delirium of typhoid fever are both manifestations of temporary insanity and persons of unsound mind owing to these toxæmic disorders have occasionally been certified to be insane. That is not of frequent occurrence, for the medical profession is educated to foresee that the mental trouble is temporary and consequent on a physical state which can be corrected without resort to asylum care and treatment. There are no doubt other causes of temporary insanity, causes more obscure and less definite in prognosis, but they are not so difficult to discover by those experienced in these maladies as to require the formidable and complicated legal procedure which has been imposed on the English public.

The question at issue is whether every person who is insane from the medical standpoint should be swept into the asylums of the country or be placed under medical certificates such as at present are in use. Is he "a proper person to be detained under care and treatment and in a fit condition of bodily health to be removed to an asylum"? These are the words of the schedule. The answer must be emphatically "No." It is well known to those directly interested in the treatment of the insane that efforts are being made to avoid the manifest evils of the present system, by introducing into the English law a provision which has long existed in Scotland, whereby those afflicted by temporary insanity can be placed under suitable private care upon the certificate of the medical attendant to the effect that the malady is not confirmed and that such treatment is necessary for a period not exceeding six months. This should have the hearty support of the medical profession in the interests of the insane. Mr. Sers entirely misses the central point of the case in suggesting that Dr. Reichardt assumed a responsibility which he was not called upon to assume. On the contrary, he fortified himself behind the authoritative opinions of Dr. Savage, Dr. Goodhart, and Mr. Kingsford. No evidence in the opposite sense, of similar weight, was adduced by the Commissioners who of course acted on the law as it stands. We may assume that they are well aware of the unsatisfactory results of the present Act which threaten to become worse in time unless remedies are applied. Yet such are the operations of the law that Dr. Reichardt after technically winning his case finds himself most severely fined. Surely there is something much amiss leading to such a fiasco. One calls to mind Mr. Anderson's hard lot when the jury awarded him heavy damages and the Chief Justice of England immediately informed him that he was not permitted to give effect to their verdict.

I urge that the medical profession should fully recognise that not every case of insanity should be sent to an asylum, that the limitations of the present law are prejudicial to the insane and to those who are bound to serve them, and that relief must be sought from the present *impasse*.

I am, Sirs, yours faithfully,

Feb. 13th, 1899. AN ASYLUM PHYSICIAN.

P.S.—Since the foregoing letter was written the Lord Chancellor has indicated a favourable opinion regarding the principle of the proposed clause in reference to incipient insanity, on the representations made by a joint committee of the British Medical and Medico-Psychological Associations on Feb. 22nd.

INTRAVENOUS INJECTIONS IN SYPHILIS.

To the Editors of THE LANCET.

SIRS,—I was much interested to see the results of intravenous injections of cyanide of mercury in syphilis published by Mr. Chopping in THE LANCET of Feb. 18th. It, however, does not appear to me that these results maintain the advantages claimed for this method of treatment. The advantages claimed are: (1) as the injection is made daily the patient is under constant observation; (2) the exact quantity of mercury introduced into the system is known; (3) the patient is brought more rapidly under the influence of mercury than by other methods; (4) serious lesions clear up more rapidly; and (5) this treatment is useful where other methods fail. The last of these claims is the only one apparently above criticism. With regard to the others: (1) daily injection is irksome and inconvenient both to the patient and the operator and requires many more injections than are given in the intra-muscular method; (2) the "exact quantity of mercury introduced into the system" is not the point in question, which is rather the effect produced on the patient by mercury under any method of administration, and this can only be judged by its effects, not by any method of measuring quantities; and (4) as to grave lesions clearing up more quickly under this treatment, this might be claimed for other methods, for those who have dealt much with syphilis know that similar lesions in

different patients vary considerably in their rapidity of disappearance and often yield to one method of treatment after resisting another. The average duration of treatment in Mr. Chopping's cases was just over 23 days, by which I understand the disappearance or healing of the lesions present at the time treatment was begun. From my experience at the Lock Hospital with inunction of mercury I should put the average at about 21 days for primary and secondary cases. With regard to tertiary cases I notice that iodides were given in all Mr. Chopping's cases and therefore the effect produced by the intravenous injection cannot be estimated. The average time for symptoms to disappear under the treatment by pills is, I believe, not more than 21 days. It therefore appears that the intravenous treatment has no advantages over treatment by pills or inunction although it may have an advantage over intra-muscular injection which is painful and, as far as my experience goes, requires a rather longer time for disappearance of symptoms.

I am, Sirs, yours faithfully,

C. F. MARSHALL, M.D. Vict., F.R.C.S. Eng.

Finsbury-square, E.C., Feb. 23rd, 1899.

"A FATAL CASE OF LITHÆMIC POISONING."

To the Editors of THE LANCET.

SIRS,—I desire while thanking Dr. Elgood for his very interesting paper in THE LANCET of Feb. 18th to point out to him that he will find a case which presents many symptoms in common with that which he relates on p. 439 of the fourth edition of my work on Uric Acid. The more important of these signs are the gastric disturbance, the high tension pulse, the enlargement of the liver, and the scanty urine; and he will also find that the relation to these of epistaxis, thrombosis, anæmia, and prostration and the final ending in coma are fully considered and illustrated by other cases. The attacks of gout are most interesting and the fact that these came between the attacks of lithæmia while the thromboses came in the attacks almost amounts to a demonstration of my explanation of causation. My patient recovered and has obtained freedom from his attacks as the result of altering his diet; and Dr. Tomson of Luton, whose patient he was, writing to me in February, 1896, some three years after I first saw him, says that he "has not had one of his attacks for more than a year."

I therefore most strongly agree with Dr. Elgood that the case he records is one of poisoning due to lithæmia or, as I have called it, collæmia. The fact which will appear when the whole of my researches have been published is that uric acid controls so completely the circulation of the blood that any accurate measurement of that circulation is a measure also of the quantity of uric acid in the blood and urine and corresponds in every way to this.

I shall presently be able to demonstrate methods by which any third-year student can estimate with considerable accuracy a greater or less quantity of uric acid in the blood or urine and tell almost without instruments and in one or two minutes of time the chief diurnal fluctuations and the pathological alterations of these; and no doubt these methods would have shown very clearly the fluctuations with and between the attacks in Dr. Elgood's case on the careful observation of which I beg to congratulate him.

I am, Sirs, yours faithfully,

ALEXANDER HAIG, M.D. Oxon.

Brook-street, W., Feb. 24th, 1899.

HUNTER *v.* CLARE.

To the Editors of THE LANCET.

SIRS,—In reply to your correspondent, Mr. J. B. Pike, I beg to enclose a copy of a letter from the clerk to the Society of Apothecaries sent in answer to a query of mine as to whether I was, as an L.S.A.—qualified since 1887—entitled to call myself a "surgeon," the query being a consequence of the decision in "Hunter *v.* Clare." I quite agree with the decision of the court and have always considered the use of the word "physician" as bad form in a general practitioner. As I understand the word a physician prescribes for a fee but does not dispense. Webster's Dictionary defines a surgeon as "one whose profession is to cure external diseases whether by manual operation or by medication—externally or internally." The word "apothecary" would be used by the public of to-day as synonymous with "chemist." If the General Medical Council felt the same with regard to the use of the word "surgeon" as "physician," why did they not proceed with that portion of the indictment? I might remind you that the triple L.S.A. entitles its holder to compete for the post of *surgeon* in the army or navy. I should be glad to know your opinion as to the use of the word "surgeon" by an L.S.A. qualified to practise surgery.

I am, Sirs, yours faithfully,

C. MONTAGUE LEAKEY.

Tower House, Caistor, Lincs., Feb. 6th, 1899.

[INCLOSURE.]

14, Austin Friars, London, E.C., Jan. 27th, 1899.

DEAR SIR,—The decision of the court in Hunter *v.* Clare does not go further than to lay down the rule that Licentiates of the Society are not entitled to style themselves "Physician." Their position as to the user of the word "Surgeon," in my opinion, remains as before.

Yours truly,

JAMES R. UPTON,

Clerk to the Society of Apothecaries.

C. M. Leakey, Esq., Caistor.

"DIFFICULTIES UNDER THE NEW VACCINATION ACT."

To the Editors of THE LANCET.

SIRS,—I also am a Public Vaccinator and see no cause to be ashamed of the position, as your correspondent "P. P." thinks we all ought to be. For my part I am as keen about the ethics of the profession as the next man and so are all my colleagues I have not the slightest doubt. "P. P.'s" letter strikes me as being altogether silly. It does not ring with a true note. For instance, he says, "If a public vaccinator may call on people of whom he knows nothing except that they have a child unvaccinated and offer his professional services, then I may call at any house where I hear there is measles and offer my professional services." Cannot "P. P." distinguish between the man who is doing his duty under Act of Parliament and the "cadger" (his own expression) unauthorised by anyone trying to force himself in where he is not wanted?

Private practitioners have the game in their own hands—they have simply to take care that all their cases are vaccinated or accounted for to the vaccination officer before they are four months old. 90 per cent. of mothers are glad to get the job over long before that if they mean having it done at all.

I am, Sirs, your obedient servant,

THOS. FREDK. I. BLAKER,

Feb. 28th, 1899. Public Vaccinator Prestonand Patcham, Sussex.

To the Editors of THE LANCET.

SIRS,—Your correspondents, "L.R.C.P., M.R.C.S.," and "P. P.," in THE LANCET of Feb. 18th and 25th respectively, before writing of fellow practitioners as they do should make themselves acquainted with the subject in question and not show such ignorance as especially your first correspondent does. In my opinion there is nothing interfering with professional etiquette in the new Act, for if the law is complied with the public vaccinator exceeds his duties if he calls on any fellow practitioner's patients. The Act says, if the vaccination is not performed within a certain time or reasonable excuse is sent to the vaccination officer, he, the vaccination officer, shall notify the public vaccinator in due form, whose duty it shall be to send in a notice to the parent or person having custody of the child in question giving at least 24 hours' notice of his intention to come and offer to vaccinate. In addition at the foot of this notice, which is known as Form I (copy enclosed), there is a space for the address of the public vaccinator. Now, why is 24 hours' notice given and why is this space left at the foot of the notice? The only reason I can put forward is, so that the receiver may communicate his or her desire as regards the call to the public vaccinator, and may inform him that the family medical man was going to do the operation or was about to postpone it. I presume that would be "sufficient reason for delay" (see General Order, Oct. 13th, 1898, page 7) and the public vaccinator should not call then and may not have to at all.

Your first correspondent writes: "I consider the action of the public vaccinator, to say the least, ungentlemanly," &c.

May I say that my opinion of your correspondent's letter is still worse; and if he shows such ignorance over an Act related so closely to his professional work after all this time it is not unlikely that he is equally ignorant in other branches of his profession, which failing may shed a new light on his jealousy of the public vaccinator in his district. Your correspondent "P. P." says, "The public vaccinator accepts the work for the sake of the pay and I might call on a case of measles for a similar reason." The analogy is absurd. Further, he wishes public vaccinators all sorts of trouble.

Both these letters are very unfair and they show gross ignorance of an Act which it is the duty of every practitioner to know. Because your correspondents' patients and themselves do not comply with the law they try to make the public vaccinators answerable. It would be about equally unfair for a solicitor to abuse a policeman for arresting a burglar who happened to be his client, or for a private schoolmaster to rail against a board schoolmaster because he happened to teach children above the general poor, if analogies are required.

I am, Sirs, yours faithfully,

Feb. 27th, 1899. FAIRPLAY.

THE BATTLE OF THE CLUBS.[1]

(FROM OUR SPECIAL COMMISSIONER.)

WESTON-SUPER-MARE.

The Formation of a Provident Dispensary at the Hospital and of a Provident Medical Association by the Medical Practitioners of the Town.

To understand the position of the medical practitioners at Weston-super-Mare it is necessary to realise how rapidly the town has sprung into existence. It is stated that in 1811 this town was but a small fishing village with 163 inhabitants. An Act of Parliament was then obtained by the local landlords and various improvements were effected. In 1828 a village of 250 houses with a population of 1500 inhabitants had come into existence. In 1851 there were 655 houses and 4033 inhabitants. The question of medical care for the poorer section of this population now became urgent and in 1857 a dispensary organised on a charitable basis was established; but the population went on increasing by leaps and bounds. In 1871 it had multiplied to 10,564, and the dispensary had already grown into a hospital. During the first two years, 1866 and 1867, the hospital had only seven beds; but during the next two years it had 16 and 17 beds respectively. After that for eight years there were 20 beds, and as the number of in-patients soon exceeded 200 per annum the number of beds was increased to 32 in 1879, and there are now 35. The population amounted to 12,872 in 1881, and it now exceeds 20,000. During these years there was a corresponding growth in the number of out-patients who attended the hospital. In 1866, the first year of the existence of the hospital, there were 923 out-patients. In 1876, the number had doubled—i.e., 1832. The maximum was reached in 1879 when there were 2968 out-patients. As the house surgeon had to go to see such patients as could not be admitted into the hospital and were too ill to attend as out-patients it soon became evident that he was overworked. It was then suggested that if a provident dispensary was organised in connexion with the hospital the services of another house surgeon could be engaged and the pressure on the hospital would thus be relieved. The idea was good in principle, but in those days no one had any experience of the evils which might arise. It was on July 1st, 1886, that the provident dispensary was opened. The services of a second resident surgeon were engaged. He is provided with free quarters at the hospital and receives a salary of £87 6*s.* 9*d.* per annum.

The hospital dispensary serves for the members of the provident dispensary and the committee which manages the hospital likewise manages the dispensary. Here, then, and from the very commencement, is a fundamental error. This committee is elected by the subscribers and donors to the hospital; the committee which manages the provident dispensary should be elected by those who by their work or their money maintain the dispensary. How can a committee of the subscribers to the hospital claim a right to decide how the pennies paid each week to the provident dispensary shall be spent? It may be said that the hospital helped the provident dispensary, but in that case the hospital committee have only the right to claim a share in the management of the dispensary which shall be in proportion to the help which they have given. Now, the accounts for the year 1897 show that the receipts due to the weekly penny payments received from the members amounted to £335. Entrance fees swelled the total to £356. The expenses did not equal this amount and there was a balance of £179 19*s.* 1*d.*, which, however, was not kept for the benefit of the provident dispensary but handed over to the credit of the hospital general account, so that to-day it is not the hospital that is helping the dispensary but it is the dispensary that is handing over hard cash to the hospital, and yet the hospital committee claim the right to govern the dispensary. It is true that the hospital management is careful to explain that this sum of £180 is not all profit. They state that the maintenance of the medical officer specially appointed to attend upon the members, and who resides in the hospital, is paid out of the general fund and the cost of the drugs and so forth dispensed to the members is defrayed from the same source in the first instance, so that the hospital has to be reimbursed for these charges before any question of profit can arise. On looking into the details of the accounts, however, it will be found that out of the dispensary funds the medical officer's salary is paid and £20 are given to the dispensary. From the balance of (in round figures £180) the hospital has the right to claim rent for the premises occupied and for the drugs dispensed. But even if a liberal allowance be made for this a profit would still remain. The medical officer of the provident dispensary by his work and the members by their subscriptions have produced an income which exceeds the expenditure. Is it right that they should be made to hand over all the net profits that arise to the hospital without being able to have a voice in the matter?

The hospital authorities say that it is not possible to apportion the cost of the drugs between the in- and out-patients attending with subscribers' notes and the provident dispensary members. Yet the average cost of the treatment of each patient is well known and the number of patients who are hospital patients and of those who are dispensary patients is likewise easy to ascertain. The computation which would be made might not be mathematically exact, but in any case it would be more correct than the present simple but arbitrary process of pocketing all the profits. At all events those who create these profits ought to have a voice in their disposal. The hospital medical staff have the right to sit *ex officio* on the management committee but they have a right to only three votes. As the lay members of this committee number 15 members the medical staff, though they do the greater part of the work, are absolutely outnumbered. It should be one of the objects of the association formed by the medical men practising at Weston-super-Mare to increase their voting power on the general committee of the hospital. These criticisms, however, must be taken as purely theoretical. I have not heard any complaints as to the hospital management. On the contrary, one or two medical men whom I have questioned on the matter have assured me that they thought that the hospital committee managed affairs "fairly well." It was also pointed out to me that the medical officer of the provident dispensary derives some advantage from the fact that he resides at the hospital. Though it is his duty to attend first and foremost to the dispensary subscribers still he is able in his leisure moments to see the hospital patients, to attend at operations, and thus to increase his general experience.

The creation of a dispensary in connexion with the hospital has led to an important revelation. There are no complaints as to abuse. The town is small, the respective positions of its various inhabitants are known, and it would be difficult for anyone to present himself at the hospital under false pretences. Yet though nearly all the patients were poor it soon became evident that the majority could have paid something and that they had no desire to be the recipients of charity. The maximum number of out-patients seen was 2968 in the year 1879. Since that date there has been a steady decrease to 2702 in 1880, 2009 in 1884, and 1898 in 1885. The number in 1886 was 1688 and the

[1] A reprint of the previous articles on the above subject has been published in book form entitled "The Battle of the Clubs," and can be obtained from THE LANCET Offices, price 1s.

provident dispensary had been started on July 1st of that year. That the decrease of out-patients is due to this fact is proved by the figures of the following year when there were only 795 out-patients. In the year following the number was 812, then it fell to 702 in 1889, to 595 in 1890, and in 1897 it was only 552. If we take the average of the last five years the number of out-patients at the hospital was 585 per annum. If, on the other hand, we take the average for the five years preceding the creation of the provident dispensary the number of out-patients was 2230 per annum. Thus it may be said roughly that not only were close upon three-quarters of the out-patients in a position to pay a small subscription, but that they actually did pay such a subscription when the opportunity was afforded them to do so.

These figures are most interesting, particularly as there is no special reason to believe that they apply only to Weston-super-Mare. The same experiment tried elsewhere might bring about similar results. Indeed, the success of the Saturday Hospital Fund in so many towns is a different manifestation of the same spirit which has led the poorer classes of Weston-super-Mare to financially support the hospital provident dispensary. These facts unfortunately have been better analysed and appreciated by speculative financial companies who build up fortunes by the wholesale collection of pennies from the poor than by the members of the medical profession. Thus the Liverpool and Victoria Legal Friendly Society sent its agents to canvass the town. All who would ensure their lives at the rate of a penny or more per week obtained on the payment of another penny medical aid when sick. This insurance company brought down medical officers of its own to Weston-super-Mare and its collectors and agents touted for these new-comers to the detriment of the old-established practitioners and to the degradation of the profession. The whole series of well-known abuses followed in due course. There was no wage limit. The medical men employed were sweated and if they complained new men were brought into the town. One practitioner employed by this insurance company had to attend a patient once every week for six months though he lived at a distance of four miles. During the last week the patient had to be seen every day at his distant home. Nevertheless, this patient only paid 4*s.* 4*d.* per annum, out of which the medical attendant received only 3*s.* and had to provide at his own cost all the medicines required.

In the face of these grievances which had lasted a few years and were becoming more and more acute the local practitioners determined to take action. The first meeting for this purpose was convoked on July 24th, 1896, and of 18 available medical men 10 attended. Those who were not present had been detained by patients and through other causes and were not absent through any feeling of indifference or hostility to the movement. On the contrary, the greatest unanimity prevailed from the very first and there was not any of that rivalry as to leadership which has marred similar movements in other towns. Nor did the hospital staff stand aloof; they, on the contrary, took an active part in what was being done. The resolution carried at the first meeting by the 10 medical men present was sent round and was signed by seven others who had not been present. The terms of the resolution agreed upon were as follows:—

> We, the undersigned medical practitioners of Weston-super-Mare, having duly considered the position of the Medical Aid Association and having obtained advice from medical men elsewhere who are best acquainted with similar associations, hereby agree to decline (1) to meet in consultation any medical man connected with medical aid and similar associations; (2) to assist him in operating or in administering anæsthetics; (3) to meet him in consultation upon patients other than those of the association; and (4) to have any professional intercourse with him. In the interests of humanity, however, we do not refuse our advice and assistance to members of the association or to other patients of the association's medical officer on the condition that he previously retires from the case.

There was another clause to the effect that this did not apply to *bonâ fide* working men's benefit societies such as the Oddfellows, &c. This, however, in itself did not suffice. It soon became evident that the insurance companies could only be fought by giving the public the option of something else organised on better lines. Therefore it was ultimately decided that the medical men should organise a medical provident association of their own and this was no easy matter. A sub-committee was appointed to work out a scheme and they had to meet over and over again to discuss the details. But at last a workable plan was adopted together with a suitable set of rules.

Weston-super-Mare, Feb. 27th.

To be continued.)

LIVERPOOL.

(FROM OUR OWN CORRESPONDENT.)

Inquests held by the Coroner of Liverpool in 1898.

DURING the year 1898 1632 cases of death were reported to, and investigated by, the coroner for Liverpool. Inquests were deemed unnecessary in 655 of these cases. Inquests were held on the bodies of 600 males and 377 females, making a total of 977, the sex, ages, and legitimacy or otherwise being accounted for as follows. Infants (legitimate) under one year, 90 males and 76 females; of one year and under seven years, 61 males and 39 females. Infants (illegitimate) under one year, nine males and five females; of one year and under seven years, two females. Children of seven years and under 16 years, 31 males and 17 females. Youths of 16 years and under 25 years, 29 males and six females. Adults of 25 years and under 60 years, 306 males and 177 females. Aged 60 years and above there were 74 males and 55 females. Post-mortem examinations were made by order of the coroner in 84 cases. Accidents accounted for the deaths of 245 males and 152 females. 75 males and 53 females were suffocated whilst in bed with parents or otherwise. 107 males and 82 females died from excessive drinking. 41 males and 12 females committed suicide while insane. Verdicts of murder were returned in four cases (females) and of manslaughter in four cases (males). 18 males and four females were found drowned. Want and exposure to cold accounted for two male deaths. 63 males and 43 females died from natural causes. Five males and two females were stillborn. Five males and eight females died from want of attention at birth. Inquests were held on the bodies of 11 male and 15 female newly-born children.

Closure of the Liverpool Lock Hospital: Opening of an Out-patient Department.

On the plea of insufficiency of funds the committee of the Liverpool Royal Infirmary have decided to close the Lock Hospital as regards the reception of in-patients early in March. It has been arranged to carry on the institution as an out-patient department of the Royal Infirmary. It is hoped that the students of University College will in this manner still be afforded the opportunities hitherto enjoyed by them for the clinical study of syphilis and other special diseases. It may be mentioned in this connexion that the Royal Infirmary and the other general hospitals in the city refuse admission to patients suffering from venereal affections, so that in future the workhouse will be the only refuge for the respectable poor who have contracted syphilis not through their own misconduct. Everyone is aware of the ravages of syphilis in its later manifestations, especially in neglected cases. An analysis of cases treated in the medical wards of general hospitals shows that a large proportion of nervous and allied diseases have had their origin from this source. It would be a wiser and a more humane policy for the general hospitals to afford facilities for the admission as in-patients of those suffering from syphilis in its early stages when it is fairly amenable to treatment than to await the period when the diagnosis shall have become obscured and the disease, in a majority of cases, shall have reached a stage which resists treatment. The example set by hospitals like St. Thomas's, St. Bartholomew's, the London Hospital, the Middlesex Hospital, the Edinburgh Royal Infirmary, &c., where these cases are admitted, might with benefit be imitated by hospitals of less repute. In the January number of the *Liverpool Medico-Chirurgical Journal* will be found an interesting communication from the pen of Mr. F. W. Lowndes on the Study and Treatment of Venereal Diseases, especially Syphilis, in which the whole subject of lock hospitals and lock wards in general hospitals is treated in an able and exhaustive manner. In alluding to the Liverpool Lock Hospital he states that it provides the only accommodation in Liverpool for males and females suffering from primary syphilis, severe cases of gonorrhœa with its complications of bubo, swelled testicle, &c. It has received in the past many English and foreign seamen of all nationalities, to whom it has been of the greatest service, not only curing their diseases but making them seaworthy and able to gain their living. It has afforded relief to many married women and children who have been infected with loathsome diseases through no fault

of their own; and he asks in all earnestness, Could there be more deserving objects of the charity of the benevolent? The Royal Infirmary, as a teaching hospital intimately connected with University College, ought to provide some beds for the reception of patients suffering from severe forms of early syphilis. If it cannot afford to maintain the Lock Hospital as a separate establishment some means can surely be found whereby a few beds could be set apart for that purpose in the infirmary, following the examples of the London and Edinburgh hospitals mentioned above. It provides a few beds for ophthalmological cases, and very properly so, but it is difficult to understand how syphilitic iritis or retinitis occurring in patients who have acquired disease through their own misconduct should receive more consideration than syphilitic manifestations on other parts of the body which may have been acquired through no fault of unfortunate sufferers, such as glassblowers, midwives, married women, and others. There is a strong feeling, not confined to members of the medical profession, that the closure of the Liverpool Lock Hospital is a mistake and the fact is received with surprise and incredulity by those who hear of it for the first time.

Liverpool Stanley Hospital: Grave Financial Condition.

The financial outlook of the Stanley Hospital is unfortunately in a very critical condition. A tone of despondency prevailed amongst all the speakers at the recent annual meeting. The hospital is situated in the north end of the city, and is in proximity to the docks where accidents are of frequent occurrence. It consequently does a large amount of useful work. Last year 662 surgical cases were admitted to the hospital as in-patients. The out-patient department is a large one; no less than 8604 surgical cases and 4898 medical cases were attended to during the year 1898. The total attendances, including special cases, reached the total of 17,686. It is a question whether the increasing deficit, which at the end of the year had reached the sum of £1865 7*s.* 3*d.*, may not eventually result in the closing of the hospital. The ordinary income for the year, including £369 7*s.* 4*d.* from entertainments and a special church collection, amounted to only £2835 11*s.* 7*d.*, and the ordinary expenditure exceeded that amount by £860 11*s.* The subscription list is limited to 548 individuals who are mostly in affluent circumstances; whereas the general public hold back their assistance, whether by reason of indifference or from the pressure of the local rates, which are now very burdensome and are likely to increase rather than diminish, is a moot point. The Stanley Hospital has had a very creditable record as regards its medical staff, five of whom are now on the staff of the Royal Infirmary, comprising two surgeons, one physician, and two assistant physicians.

Liverpool Eye and Ear Infirmary: Annual Report.

The financial position of the Eye and Ear Infirmary opened at the beginning of 1898 with a credit balance of £112 8*s.* 10*d.*, but it closed with a debit balance of £368 12*s.* 1*d.* The reduction of income was due to the falling off in donations and legacies. For the first time for many years not a single legacy had been received, whilst the donations were £51 4*s.*, as against £261 5*s.* 6*d.* in 1897. The sum of £480 was received from the Hospital Sunday and Saturday Fund. The report states that 6149 new eye cases and 2121 new ear cases had been treated during the past year in the out-patient department. The number of minor operations on out-patients was 1147. 709 patients had occupied beds in the infirmary and the number of important operations in this department was 576. Mr. H. H. Hornby has resigned the position of honorary treasurer, which he had held for 25 years.

The Guardians of Liverpool and the Treatment of Tuberculosis.

At a conference of Poor-law guardians representing the three large unions of Liverpool held in the board-room of the West Derby Union it was unanimously decided to make an effort to treat cases of tuberculosis amongst the poor, and in furtherance of this view it was agreed to erect a sanatorium in some suitable locality for the treatment of early cases. This is the first instance in which Poor-law guardians have taken such a generous and enlightened view with regard to the subject of tuberculosis, and it is to be sincerely hoped that the good example will be followed by other boards of guardians throughout the country. A complete scheme has been drawn up by Dr. Nathan Raw, medical superintendent of Mill-road Infirmary, which has regard to the treatment of early cases in sanatoria and the isolation of chronic or hopeless cases in separate wards of Poor-law infirmaries, together with the necessary precautions to prevent the spread of the disease.

Bequests to Liverpool Hospitals.

The Royal Infirmary has received £1000 and the Royal Southern Hospital, the Northern Hospital, the Stanley Hospital, the Bootle Borough Hospital, the Infirmary for Children, and the Outdoor Maternity Charity, Brownlow-hill, £500 each, the bequests of the late Miss Mary Anne Macneilledge of Liverpool.

Liverpool Northern Hospital.

Mr. R. W. Murray, F.R.C.S. Eng., honorary surgeon to the Liverpool Infirmary for Children, has been appointed honorary surgeon to the Northern Hospital in the room of the late Mr. Arthur H. Wilson.

The School of Tropical Diseases.

A meeting of the committee of the Liverpool Association of Foreign Consuls was held on Feb. 27th in the office of the Brazilian Consulate for the purpose of taking into consideration the Liverpool School of Tropical Diseases and its recognition by the Governments of the various consuls. The company having been addressed by Mr. Alfred L. Jones, as representing the Congo Free State, and by Mr. Ehrenberg, consul for Sweden and Norway, it was agreed to hold a general meeting of the consuls on March 9th so that they might be better able to inform their Governments on the subject. Professor Boyce then explained that four courses of two months each would be given to qualified men every year. Liverpool, he thought, was the best possible place in which to establish such a school, as they had examples of the diseases in question brought from all the tropical regions of the world. Besides instructing qualified medical men who would have appointments on shipboard or intended to practise in tropical countries they would admit missionaries to the classes and would also train black women as nurses.

Feb. 28th.

SCOTLAND.

(FROM OUR OWN CORRESPONDENTS.)

Retirement of Dr. John Sibbald, Commissioner in Lunacy.

DR. JOHN SIBBALD, who has filled the office of Commissioner in Lunacy for 21 years, will retire under the age limit at the end of March. In Dr. Sibbald's case there has been a nine months' extension of his period of service. Dr. Sibbald was educated at Edinburgh University and took the degree of M.D. in 1854. In connexion with asylum work he has filled various posts. For some years after graduation he was an assistant physician in the Edinburgh Royal Asylum. In 1862 he was appointed superintendent of the Argyll District Asylum and in 1870 he was made a Deputy Commissioner in Lunacy. He received his present appointment in 1878. Dr. Sibbald was co-editor of the *Journal of Mental Science* from 1870 to 1872 and in 1877 he was the Morison lecturer on Insanity to the Royal College of Physicians of Edinburgh. Among his literary contributions may be mentioned "Clinical Instruction on Insanity," "Gheel and Cottage Asylums," "Lunacy Administration in Berlin and in Scotland," and "Plans of Modern Asylums." In "Plans of Modern Asylums" Dr. Sibbald gives a full account of the Alb-Scherbitz Asylum in Prussian Saxony which has led to the adoption of similar plans for the new hospital for Edinburgh at Bangour. As a Commissioner in Lunacy Dr. Sibbald has done much to improve the condition of the insane in asylums and private institutions and has won the respect and confidence of superintendents of asylums throughout the country.

Edinburgh New Town Dispensary.

At the annual meeting in connexion with the Thistle-street dispensary held on Feb. 23rd the medical officers' report stated that 8164 cases had been dealt with at the dispensary and of these 764 patients had been seen in their own homes. The institution had recently lost many friends through death and the subscriptions were less than they had been in the previous year. The expenditure, however, had also been less and there had been an increase in the legacies.

Funeral of Professor Rutherford of Edinburgh University.

On Feb. 25th Professor Rutherford's body was conveyed from his residence, at Douglas-crescent, Edinburgh, by rail to Belses Station and thence by road to Ancrum Churchyard. A large number of the University professors and students were present at the service which was conducted in his house at 9 A.M. by the Rev. Dr. Scott of St. George's. A number of beautiful wreaths were sent, among them being wreaths from Sir William Muir, from the present members of the late Professor Rutherford's class, from former assistants, from members of the South African Students' Union, from the Students' Representative Council, from the past and present University lecturers, from the members of the Australasian Club, from the assistants and research workers in the Physiological Laboratory, and from the residents of the Royal Infirmary. After the arrival of the train at Belses the coffin was carried shoulder high from the carriage to the hearse by members of the late Professor Rutherford's class and of the Students' Representative Council. When the churchyard was reached the coffin was again carried by students from the churchyard gate to the grave. Among the pall-bearers were Professor Simpson, representing the Royal College of Physicians and the University of Edinburgh; Dr. Carlier, assistant to the late Professor Rutherford; Mr. Carnegie Dickson, representing the students; Dr. Rutherford of Kelso, and several other relatives; Professor Stirling, Owens College, Manchester; and Professor de Burgh Birch, Yorkshire College, Leeds. Former assistants of the Professor were also present at the interment.

Royal Edinburgh Asylum for the Insane.

The annual meeting of the Corporation of the Royal Edinburgh Asylum was held on Feb. 27th. From the report of the managers it appeared that the average daily number of patients under treatment showed an increase of 23 on the numbers for last year. The ordinary revenue amounted to £53,362 6*s.* 5*d.* and the ordinary expenditure, including interest, to £48,951 11*s.* 7*d.*, leaving a surplus revenue of £4410 14*s.* 10*d.* From this surplus the annual instalment towards liquidation of the West House debt, amounting to £1727 4*s.* 7*d.*, had to be subtracted, leaving a free surplus of £2683 10*s.* 3*d.* The surplus derived from Craig House was greater by £1413 9*s.* 6*d.* than the surplus in 1897. The surplus derived from intermediate patients exceeded what it was in 1897 by £9 18*s.* 11*d.* The cost of maintenance per head of the latter class of patients had been £40 12*s.* 9½*d.*, the rate of board chargeable for them being £42 per annum. Although in February, 1898, the managers had been compelled to raise the rate of board chargeable for pauper patients from £30 to £31, they had been disappointed in their expectation that the additional £1 of board would be sufficient to meet the cost of maintenance. During the year the cost of pauper maintenance had been £32 1*s.* 10¾*d.* per head, so that there was a deficit in that department of £740 9*s.* 3*d.* They feel, therefore, obliged to raise the rate of pauper maintenance to £32 per head for the year commencing April 1st, 1899. The increased expenditure in this department during 1898 was due to a rise in the price of flour and potatoes, the former during the greater part of the year being 3*s.* per bag dearer, while the latter had shown an increase in price of 10*s.* per ton. During the year the West House had been provided with a new boiler and boiler-house and the drainage system of that building had been reconstructed at a total cost of £1613 16*s.* 2*d.* The asylum had been visited in March by Dr. Sibbald and in November by Dr. Fraser, Commissioners in Lunacy, the reports by these gentlemen being highly satisfactory. Dr. Fraser, however, referred to the increase in the number of pauper patients and the overcrowding of West House, with the consequent difficulty in accommodating private patients at the lowest rate of board. In connexion with this point the managers reported that arrangements are being made with the District Lunacy Boards of Stirling and Lanark to provide accommodation within their districts for 60 patients from the West House. The report of the physician-superintendent, Dr. Clouston, stated that the average number of patients resident during the year was 910, of whom 447 were men and 463 women. The number of admissions—451—was the largest the managers ever had in any year except in 1894 and 1896, and had they been able to admit all the patients who applied at the lower rates of board would have been one of the highest on record. Dr. Clouston found, in reviewing the 25 years during which he had had charge of the asylum, that the average number of patients sent to the asylum had risen gradually by 23 each quinqenniad, and last year they had received about 200 patients more than in his first year. That increase had taken place more among the rate-paid than the private patients. He believed this increase was likely to continue, not from any actual increase of insanity in the country, but because the benefit and convenience of asylums for the insane were being more realised by the community. The great aim of modern medicine was the prevention of disease and its next aim was to get disease under control in its early stages. In most cases of insanity one had to come to the conclusion that the disease could not have been prevented, it being usually due in the first place to a predisposition to nervous instability and in the second place to events in the patient's physiological life, his circumstances, or his surroundings over which he and others had no control. Many of the cases, however, arose from over-indulgence in alcohol and immorality. Dr. Clouston went on to speak of old age in relation to insanity. It would evidently be an important aim of the mental medicine of the future to teach how the brain might develop safely and grow old safely. He had daily evidence of one thing—that after 50 years of age men and women should be more careful of alcohol, of excesses, and of avoiding the causes of rheumatism, gout, bronchitis, &c., because their diminishing nerve energy was less capable of coping with these enemies of health. The death-rate in the asylum during the year had been 11·3 per cent. on the average number resident, this being 3 per cent. more than the rate in the royal and district asylums of Scotland in 1897. Dr. Clouston concluded by referring among other points to the favourable opinions expressed by visitors to the institution during the meeting of the British Medical Association in the summer, to the fruitful work done by Dr. Ford Robertson at the Scottish Asylums Laboratory, and to the appointment of Dr. Middlemass to Sunderland Asylum. Dr. Clouston also said that at the conclusion of 25 years' service he appreciated more and more highly the continued kindness and indulgence of the Board of Ordinary Managers.

Edinburgh Royal Infirmary Managers.

At the meeting of the managers of the Edinburgh Royal Infirmary held on Feb. 27th sympathetic references were made to the death of Sir John Struthers and of Professor Rutherford. It was agreed that copies of a minute recording their sorrow at the death of their friends be sent to the relatives of each. At the same meeting Dr. Allan Jamieson was re-appointed for five years as physician for diseases of the skin and Mr. William Guy for one year as dental surgeon.

The Water-supply of Aberdeen.

In the summary of the vital statistics of Aberdeen for 1898 just issued by Professor Matthew Hay, M.D. Edin., medical officer of health of the city, he, while admitting that the high death-rate during the year referred to from gastric and intestinal irritation cannot be definitely ascribed to the water-supply, that the deaths from diarrhœa were under the average and that the prevalence of typhoid fever was not greater than usual if the cases due to milk infection are excluded, goes on to say: "Nevertheless, I feel it my duty to emphatically state that as long as the aqueduct remains in such a condition that at any one point in its course sewage may at any one time find its way into the water, and as long as the water-supply is drawn from a river open at several points to sewage pollution and such water-supply is not filtered, then so long does the city run the risk of being submitted at any moment to a serious and widespread epidemic of diarrhœa, typhoid, or cholera."

Aberdeen City Hospital.

The salary of the resident physician at this hospital has been fixed at £75 with residence for the second year's service. It commenced at £50 only.

New District Hospital near Aberdeen.

The Aberdeen District Committee of Aberdeen County Council has agreed to erect a district hospital for infectious diseases (14 beds) at Summerfield, near the city of Aberdeen. The estimated cost is £4000 and Mr. J. D. Watson, county engineer, is architect. It is the wish of the committee that the building should be finished and quite dry before October next.

Aberdeen Natural History and Antiquarian Society.

The following office-bearers have been appointed:—President: Professor Trail (Botany), University of Aberdeen.

Vice-President: Mr. William Ferguson, LL.D., of Kinmundy. Secretary: Mr. Robert M. Clark, B.Sc., assistant to Professor Trail. Treasurer: Mr. James Spence of Pow.

Lord Rectorship of Aberdeen University.

The students are already moving as to the selection of a Lord-Rector to succeed the Marquis of Huntly in November next. The names of Lord Aberdeen, Lord Rosebery, and Sir David Stewart, ex-Lord Provost of the city of Aberdeen, have been suggested as candidates and in any event a contest is expected.

Feb. 28th.

IRELAND.

(FROM OUR OWN CORRESPONDENTS.)

The Irish Poor-law Medical Service.

A MEETING of the medical profession will be held at the Royal College of Surgeons in Ireland on March 2nd in connexion with the reforms of the Irish Poor-law medical service. The President of the Irish Medical Association will occupy the chair and in addition to others the following have promised to address the meeting: the Presidents of the Royal College of Physicians and of the Royal College of Surgeons, the Regius Professor of Medicine, Trinity College, Dublin, Sir William Stokes, Sir Thornley Stoker, Sir Charles Cameron, and others.

The University Question.

The vexed question of university education in Ireland is still much discussed and two most important letters have appeared, one from the President of Queen's College and the other from Professor Dill, M.A., late Fellow and Tutor of Corpus Christi College, Oxford, both strongly advocating on academic grounds the establishment of a university in Belfast on the lines proposed by Mr. Balfour. At a meeting of the Belfast Medical Students' Association the following resolutions were passed:—

1. That the present state of university education in Ireland is unsatisfactory.
2. That the establishment of denominational universities cannot fail to be detrimental to medical education in Ireland.
3. That the Royal University of Ireland should be maintained but that the various public colleges should be adequately endowed.

Lisburn Infirmary.

It appears from the annual report that for the year ending Nov. 30th, 1898, there were 370 patients under treatment in this infirmary. During the same period there were 607 extern cases and as regards both in- and out-patients there is an increase over previous years. There were 244 accidents attended to during the year. 40 operations were performed. The house adjoining the infirmary having been added to the hospital the nurses have been moved into it and it is expected that shortly wards will be opened in it for private patients.

Nursing in Irish Workhouse Infirmaries.

The Local Government Board are determined that they will not recognise nurses who have not received training for less than two years in a clinical hospital. The matter came on for discussion at the Londonderry Board of Guardians on Feb. 25th, when it was complained that the Local Government Board were endeavouring to confine the teaching of nurses in Ireland to Dublin and Belfast, a line of action which would be resisted by the county infirmaries and other hospitals. One of the guardians (a medical man) stated that it would be impossible for boards of guardians to get a nurse fully qualified according to the rules of the Local Government Board unless salaries of over £40 yearly were offered.

The Belfast Royal Hospital.

The quarterly meeting of the friends of this charity was held on Feb. 27th and was of interest as being the last meeting of the old hospital because the new revised charter by which the Royal Hospital is submerged in the new Royal Victoria Hospital became law on Dec. 12th, 1898, and under its conditions the annual meeting of the new corporation must be shortly held at which a new board of management must be elected. The balance due by the hospital on Oct. 31st was £3228 16*s.* To meet this the board decided to raise £3000 by the sale of invested capital. For the five months ending Jan. 31st £3518 9*s.* have been received from all sources, while the expenditure has been £4689 9*s.* 6*d.*, being an outlay over receipts of £1171 0*s.* 6*d.* The debt against the hospital at the close of the last financial year was £2164 12*s.* 11*d.*; up to the end of the present quarter the debt was £1662 14*s.* 5*d.*, but this will be covered by the sale of securities. A sum of £440 was realised through the sale of tickets to view the launch of the *Oceanic* and Lady Henderson (wife of the late Lord Mayor) collected from friends a sum of £150 for the charity. On Jan. 16th of this year the new Royal Victoria Hospital came into existence, when practically the old "Royal" ceased to exist and became merged in the new charter. A meeting of subscribers to the old and the new hospital will shortly be summoned to elect the new board of management and under the terms and conditions of the new charter only life governors and annual subscribers of £2 2*s.* and upwards will have the right to exercise the power of voting at such meeting. During the past quarter there were 599 intern (379 surgical and 220 medical) and 5851 extern cases.

Death of Dr. William C. Townsend of Cork.

I announced last week the death of Dr. William C. Townsend who for many years was the senior member of the profession in Cork. 60 years ago he commenced practice. Early in his career he was appointed one of the medical officers of the Cork Union Hospital and recognising the advantage country air would prove to the numerous tuberculous children in that institution he earnestly urged the guardians to adopt the boarding-out system. This advice was acted on and he had the satisfaction of knowing in after years that through his instrumentality many little ones, who had they remained "cabined, cribbed, confined" would have eked out a short and miserable existence, grew up vigorous and healthy members of the community. Dr. Townsend afterwards became visiting physician to the Cork South Infirmary and many of his pupils now scattered all over the globe will have a kindly recollection of his assiduous, sympathetic care of his patients and of the great zeal which he displayed in imparting to his class the information he had gained as an intelligent, observant, clinical diagnostitian. He was also visiting physician to the Cork District Lunatic Asylum and for many years had an extensive practice in the south of Ireland as a consulting physician. He had attained the ripe age of 81 years and all the public bodies in Cork expressed respect for his memory by passing votes of condolence with the members of his family.

March 1st.

PARIS.

(FROM OUR OWN CORRESPONDENT.)

The Rating of Private Hospitals.

A SOMEWHAT singular situation has arisen with regard to the rating of private hospitals (*cliniques*). Formerly these institutions were exempt from any tax inasmuch as they served the cause of charity as well as that of education. In 1894, however, the Chamber of Deputies raised all the taxes imposed upon the liberal professions, those of medical men being raised from one-twelfth to one-fifteenth of their rent. At the same time the tax commissioners assessed medical men who owned private hospitals not only on the rental of the hospital but also on the rental of the owners' private rooms, so that the rate payable was very largely increased. Dr. Vignes, a well-known Paris ophthalmic surgeon and the registered owner of an important private hospital, was anxious to find some way of avoiding this rate and as the rate upon *maisons de santé* is much lower than that upon private hospitals he registered his establishment as a *maison de santé*, this being quite a natural course because he had a number of beds and because he performed operations. The Council of the Prefecture, in giving judgment on appeal in this case, decided that Dr. Vignes's establishment was a real private hospital because he did not occupy the whole of the building. Dr. Vignes therefore had to pay the higher rate exacted from medical owners of private hospitals. In the meantime the Boisleux case occurred and the Prefect of Police ordered a very strict inspection of all *maisons de santé* to avoid any similar scandals in future. An inspector accordingly arrived at Dr. Vignes's establishment. Dr. Vignes, however, refused to admit him, saying with perfect truth that the Council of the Prefecture had decided that his establishment was really a private hospital and not

a *maison de santé*. He also showed the inspector the receipt for the rate paid upon this assessment. The inspector was deaf to all remonstrances and made a forcible entry, when he found several female patients who had recently been operated upon in bed. The next thing was that Dr. Vignes was prosecuted for keeping a clandestine *maison de santé* and was condemned in heavy damages, while the establishment was ordered to be closed. This judgment, which shows the spite with which the tribunals pursue medical men, has astonished the members of that profession. It may be useful if I explain at somewhat greater length the difference between a *maison de santé* and a *clinique*. A *maison de santé* is a private nursing home, a purely commercial institution kept by a proprietor who is not necessarily a medical man but who receives patients for medical men who keep such patients under their own care. The patients may be medical, such as weak-minded persons, morphiamaniacs, and the like, or they may be surgical and simply go into the house for an operation. Many *maisons de santé*, especially the surgical kind, are managed by one or other of the religious communities. The *clinique*, on the other hand, belongs to one particular medical man who gives gratuitous advice. In practice, however, many *cliniques* derive their importance from possessing a few beds where the medical man receives patients for operation at low fees, the responsibility both administrative and medical being his alone. This kind of *clinique*, it will be seen, bears a close resemblance to a *maison de santé* owned by a proprietor who happens to be a medical man and from a confusion of ideas arose the incident which I have narrated.

On the Use of a Mask during Operations.

At the meeting of the Society of Surgery held on Feb. 21st, Professor Berger read a paper on the Use of a Mask by the Surgeon during Operations, especially in cases of abdominal section. According to him the particles of saliva given off by the surgeon during an operation form a by no means unimportant source of infection. He had noted the fact through bacteriological experiments that although the silk and other materials used for sutures were always perfectly aseptic before use, yet when once in contact with the wound they gave rise to stitch abscesses which though not very serious, yet healed with difficulty and were very tiresome. Since he had taken to using a mask he had noticed that his operation results had greatly improved. Of 70 operations for the radical cure of hernia performed since Oct. 1st, 1897, the date at which he first commenced the use of the mask, suppuration had occurred only in two, whereas formerly suppuration occurred in one out of every five or six cases.—Professor Tarnier said that for his part he had never used a mask and probably never should do so. He considered that sutures were infected by the hands and not through the agency of the breath. He had tried the effect of his hands upon gelatin plates both before and after operations and found that at the end of an operation they were septic. Sutures must be handled as little as possible and always taken up with forceps so as to avoid infection.—In reply Professor Berger contended that if the stitches came away it was not because they were infected but because they came from an infected wound.

An International Congress of the Medical Press in 1900.

At the last meeting of the French Medical Press Union the question of a congress of representatives of the medical press to be held at the great Congress of 1900, an idea which had been submitted at the previous meeting by Dr. Blondel, came up for discussion. The chief subject of inquiry was as to whether this congress should be a mere sub-section of the great International Congress or an independent congress. This latter view of the matter was the one finally taken in accordance with the terms of a report drawn up by Dr. Blondel, whose conclusions were unanimously adopted. In 1900, then, there will be a congress to which will be invited representatives of the medical press of the entire world. An application for incorporation among the official congresses of the exhibition was submitted to the chief committee of the exhibition—a task undertaken by Dr. Beaudouin—and the sub-committee appointed to examine applications passed this one on Feb. 24th. The organising committee will be formed by members of the French Medical Press Association and its details will be settled at the next meeting. Among the questions to be discussed at the congress is that of the advisability of forming a permanent international Medical Press Association, an idea which was first mooted at the Congress held at Rome by Dobrzychi and which was in a measure begun to be carried out at the initiative of Posner, Laborde, Beaudouin, Brown, Rubino, and others. A meeting was, as a matter of fact, proposed to be held in Brussels, but it never took place. The active work of the association, upon which was grafted an idea of centralising the work of the congress, was put off until the Moscow Congress, where, however, there was so much confusion that nothing was done. There is every reason to believe that the meeting in Paris in 1900 will prove a great success. The Association of the Italian Medical Press, through its president, Dr. Bossi, has already declared its complete adhesion to the scheme of Dr. Blondel.

The Academy of Medicine.

Lord Lister was nominated a special foreign member of the Paris Academy of Medicine on Feb. 28th.

Feb. 28th.

SWITZERLAND.

(FROM OUR OWN CORRESPONDENT.)

Diphtheria Antitoxin.

DR. OTTO WENNER, house physician to the Zürich Children's Hospital, has compiled a careful account of the cases of diphtheria under antitoxin treatment from Oct. 25th, 1894, to May 25th, 1898. The results will shortly be published in an inaugural dissertation. Of the 385 cases where bacteriological evidence could be adduced 86 were subjected to intubation and 32 to tracheotomy. 500 or 1000 units of either Behring's or Bernese antitoxin serum were injected once or repeatedly, according to the severity of the case. In 120 cases albuminuria was noticed, and this proportion of 31 per cent. contrasts very favourably with the 57 per cent. of albuminuria during the period, 1874-94, when the antitoxin treatment was not yet resorted to. The reduction of the rate of mortality during the period of antitoxin treatment is remarkable and corroborates evidence already supplied by German and English statistics.

	1874–1891	1891–1894	1894–1898
Number of cases	690	149	385
Mortality per cent.	43·8	40·3	9·8
Cases operated on	404	79	118
Mortality per cent.	63·4	65·8	19·4
Cases not operated on	286	70	267
Mortality per cent.	16·1	11·4	5·6

Diphtheria and Heart Disease.

At the last meeting of the Medical Society of Zürich Professor Ribbert reported on four cases of sudden death from heart collapse in diphtheria. Evidence of considerable degeneration of the muscular tissue was forthcoming in each case, there being hardly any inflammatory processes. The best histological stain was a combination of hæmatoxylin with picramic acid and acid fuchsin. No bacteria could be found in the tissues and the degeneration in such cases is due to the effect of the toxins produced.

Clinical Society of Zürich.

The meetings of this society, which are held every two months either in Zürich or Berne, continue to be well attended and prove very instructive to the general practitioner, as subjects of general interest are always chosen. On Feb. 6th Professor Eichhorst lectured on the Diagnosis of Diseases of the Digestive Apparatus. Professor Müller demonstrated some interesting cases of Herpes Tonsurans Capillitii, an affection as rare in Switzerland as it is common in England; there were eight cases in one family all infected from one English boy. He also demonstrated a very obstinate case of Sycosis Parasitaria in which dressings of corrosive sublimate proved very efficacious.

Death of Professor Socin.

The Bâle Medical Faculty deplores the loss of Professor Socin who died on Jan. 21st at the age of 62 years after having been professor of clinical surgery since 1864. He studied at the universities of Bâle and Würzburg where he graduated in 1857. He took an active part as surgeon in the Franco-Prussian War and his experiences, published in 1872, were of great interest. His chief work was a book on prostatic disease which came out in 1875 as part of Pitha and Billroth's

"Encyclopædia of Surgical Pathology." He was a very genial man, full of wit and humour, devoted not less to medical science than to art and music, and his death leaves a void in local society.

The Orthopædic Institute of Zürich.

Dr. W. Schulthess has been demonstrating the following cases to the Medical Society of Zürich. 1. A child, aged six years, with Partial Paralysis of the Left Leg from the Knee downwards, combined with Partial Muscular Hypertrophy. It is of interest that the mother of the child had a severe fall during pregnancy. A photograph of the patient at the age of one year distinctly showed a difference, now more pronounced, in the two feet, so that the paralytic affection must have occurred either during uterine life or in the earliest period of infancy. There was partial paralysis of the anterior and posterior tibial muscles, hypertrophy of all the posterior muscles of the left leg from the knee downwards, otherwise muscular atrophy (? retraction), shortening of the left leg, and secondary pes equino-varus. Slight differences in the muscles of the left arm pointed to a cerebral origin of the paralysis. 2. A boy, aged 16 years, who from early youth had showed signs of severe scoliosis, which, however, did not hinder him from going to school and running about like other children. At the age of 15 years increasing weakness in both legs supervened without any previous illness or any symptoms of spondylitis; this was followed by spastic paralysis, which persists to this day. Dr. Schulthess considered it to be a case of a rare condition—namely, compression myelitis due to the scoliosis.

Zürich, Feb. 23rd.

ROME.

(FROM OUR OWN CORRESPONDENT.)

The League against Tuberculosis.

ITALY long stood alone among continental countries in maintaining that pulmonary phthisis was communicable, and English-speaking physicians in Rome and Florence used to complain of the difficulty, sometimes insuperable, of getting phthisical patients admitted into hotels or pensions except at a price which would leave the proprietor free to shut his house against all other arrivals. Right in her surmise, for it was nothing more, Italy has now to follow the lead of those countries which have come round to her way of thinking, and at this moment is actively copying their provisions for limiting the spread of the disease and for promoting its cure in cases where it has been established. At Padua on Feb. 22nd a very important meeting was held at which public hygienists, the occupants of academic chairs in medicine (theoretical and clinical), and general practitioners combined to found "una lega nazionale contro tubercolosi." The rector of the University, Dr. Achille de Giovanni, who is also professor of clinical medicine, presided, and in the course of a powerful and impressive speech he described the urgent necessity for such a new departure and he also set forth the lines on which it will proceed. The league will be composed of regional committees and these will elect the national committee which will have its headquarters in Rome. Next week a not less important meeting will be held in Turin and Dr. Pio Foà, the distinguished professor of general pathology and supplemental lecturer on bacteriology in the university, will be the spokesman of the occasion. His special theme will be "Sui Sanatori popolari per la cura della Tubercolosi," and his discourse will be at once a scientific exposition and a medical propaganda. An anticipation of its tenour with which I have been favoured indicates his line to be the following. Popular sanatoria are in these days the solution of a tripartite problem—(1) medical, (2) hygienic, and (3) social. Medicine claims first consideration, because in the sanatoria for tuberculosis her "cures" attain the high proportion of 30 per cent., while her "improvements" are at least 45 per cent. Hygiene comes next, since in the sanatoria, and in these alone, the patient succeeds in mastering the methods by which he preserves those around him from the contagion of the disease. Sociology takes the third place—phthisis (or pulmonary tuberculosis) being but the most pronounced form assumed by "miseria fisiologica" (physiological impoverishment) and in the last resort by the economic "miseria" of an individual or a race. The foundation of popular sanatoria for the treatment of phthisis is therefore the practical outcome of that principle of mutual aid according to which the more favoured assist the less favoured classes—assist them, moreover, not by the fitful relief of a "charity," often capricious and always incomplete, but in conformity with the methods of an intervention at once continuous, direct, and well-systematised. All civilised countries have, to a greater or smaller extent, equipped themselves with such sanatoria. Germany, France, Switzerland, Austria, and others are already provided with them. Italy alone, as I have said, has still to follow, and not a day too soon. According to the latest statistics tuberculosis kills 70,000 of her inhabitants every year and reduces to the invalid state well-nigh 1,000,000 within the same period. Hitherto she has been content to look on and to report the success of neighbouring nationalities, as of Switzerland at Bâle and of France at Lyons; but now the initiative taken by Padua and Turin will be imitated in some of her other great centres and the projects already formulated by such municipalities as those of Brescia and Milan will have their counterparts in cities further south. Rich in climatic resorts of every kind, Italy has a magnificent opportunity of utilising these in the foundation of "sanatori popolari" and of showing to Europe what she is capable of in her hygienic as well as in her political "risorgimento." On a minor scale, indeed, she has demonstrated what she can do for the prevention and treatment of such local epidemics as pellagra—the "pellagrosai" in Lombardy having already more than justified their institution. Here again her activity is laudably on the increase, and at Padua, on April 8th, she will hold a congress "contro la pellagra" which is to last three days and at which not only the Venetian but the Lombard communes will be largely represented.

Professor G. B. Grassi on Recent Studies in Malaria.

In a lecture delivered before a mixed but chiefly professional audience on Feb. 26th at Milan Professor Grassi gave his most recent views on the accessions made to our knowledge of "malaria." The cause, essential and primary, of the fever is, he said, "a sporozoon, an organism infinitely small, developing itself through a special evolutionary cycle in a particular species of mosquitoes affecting malarious localities, which sporozoon is inoculated in man by the puncture of the said species of mosquitoes." The lecture re-traversed the ground already traced in this correspondence and need be referred to no further than as confirming the account of the Italian contributions to the discovery of the special mosquito (the *anopheles claviger*) already given to your readers. Of more interest was Professor Grassi's conclusion as to the "mode of combating malaria." This consists in "making war on the mosquitoes, destroying them, and so preventing their reproduction." The marsh waters, he said, in malarious districts from being stagnant should be made to flow. Drainage on a large scale is not needed for this object. It would suffice, in the months during which the mosquitoes are prolific, to carry out "proscingamenti temporanei" (temporary dryings up or soil desiccation). This, he assured his audience, would "save entire regions from a terrible scourge."

Feb. 25th.

CONSTANTINOPLE.

(FROM OUR OWN CORRESPONDENT.)

The Imperial Medical Society.

THE Imperial Medical Society held an extraordinary meeting on Feb. 15th to receive the report for the past year and to elect the President and officers for the current year. Dr. Stekoulis presided and opened the meeting with a brief address, in which he stated its objects. He announced that the endeavours of the society to render obligatory the notification of infectious diseases were likely to prove successful. The secretary then read the report of the past twelvemonth, gave a summary of the more important discussions, and drew attention to the number of original papers, many of which treated of surgery, ophthalmology, epidemiology, and rare cases. He spoke at great length of phakotherapy and the confirmation which modern experience was giving to M. Apéry's theories. After referring in terms of regret to the death of two valued members, Dr. Plessa and Dr. Nuridjian, he enumerated the honours and distinctions which the Sultan had bestowed upon members of the society and

concluded with declarations of loyalty which were received with cheers for His Imperial Majesty. The elections then took place, Dr. Stekoulis being re-elected President. In the evening 23 members dined together to celebrate the forty-fourth anniversary of the society.

Mortality in Constantinople.

The mortality returns for January show a total of 1445 deaths, of which 887 were of Mussulmans (444 males and 443 females), 474 of Christians (272 males and 202 females), and 84 of Israelites (40 males and 44 females). Unusually fine as the winter has been this year there is, nevertheless, much illness about, more especially pneumonia and other affections of the respiratory organs brought on by imprudent exposure and carelessness. During last week 53 deaths—nearly 18 per cent. of the total—were due to diseases of this character.

Small-pox.

In view of the spread of small-pox in different parts of the metropolis, 14 deaths from this cause having occurred last week, an Imperial Iradé has been issued which orders especial precautions and efficient measures to be taken against the spread of the disease. Public vaccinators have been appointed whose duty will be to visit every quarter of the city and compulsorily vaccinate the pupils of different schools as well as grown-up persons. Some of the thickly populated quarters are in an excessively unhygienic condition and the authorities are trying to cleanse the streets. I am sorry to record that the British Postmaster, Mr. Frederick Stewart Cobb, died on Feb. 16th at the French Hospital, at the age of 56 years. Mr. Cobb was taken unwell on Feb. 7th and small-pox declared itself on Feb. 10th, when he was at once conveyed to the French Hospital. Being unfortunately in a very enfeebled state of health he was unable to offer much resistance to the disease. His death is a calamity for the British colony here.

Feb. 21st.

Medical News.

ROYAL COLLEGE OF SURGEONS IN IRELAND: FELLOWSHIP EXAMINATION. — The following candidates having passed the necessary examination have been admitted Fellows of the College:—

Mr. J. Knox Denham, L.R.C.S. Irel., Mr. E. J. Moore, L.R.C.S. Irel., and Mr. T. G. Stevens, L.R.C.S. Irel.

The following candidates have passed the primary part of the examination for the Fellowship of the College:—

Mr. R. J. Coulter, B.Ch. R.U.I., Mr. J. P. Frengley, B.Ch. R.U.I., Mr. R. D. Joyce, M.R.C.S. Eng., Mr. C. R. Boyce, Mr. R. Glenny, Mr. P. J. Hanafin, Mrs. H. L. Hennessy, Mr. J. M. S. Levis, and Mr. J. F. Peart.

APOTHECARIES' HALL OF IRELAND.—The following candidates have passed the recent examinations for the Licence in Medicine, Surgery, and Midwifery:—

Physiology.—S. Adye Curran and L. J. Farrell.
Anatomy.—S. Adye Curran and A. J. Barnes.
Materia Medica.—A. J. Barnes.
Pathology.—W. P. Harding.
Surgery.—W. W. Feris.
Midwifery.—W. W. Feris.
Ophthalmic Surgery.—W. W. Feris.
Completed third professional examination.—W. P. Harding.

The following have received the diploma of the Hall:—F. G. Adye Curran, W. P. Delahunt, J. D. Power, M. P. O'Brien, and J. J. Ahern.

VACCINATION AT GLOUCESTER.—At the meeting of the Gloucester Board of Guardians held on Feb. 21st it was decided by 28 to 15 votes to rescind a former resolution with regard to vaccination and the appointment of public vaccinators and to proceed to the appointment of a vaccination officer and public vaccinator for No. 1 district and to otherwise carry out the requirements of the General Order of the Local Government Board in regard to vaccination.

CREDITON BOARD OF GUARDIANS AND MIDWIFERY FEES.—At the meeting of the Crediton Board of Guardians held on Feb. 18th the case of Mr. Haycroft, M.R.C.S. Eng., and the midwifery fee which was reported in THE LANCET of Feb. 18th was discussed. A member moved a resolution that the case be carried to a higher court. This was seconded, but an amendment moved by Sir John Shelley that the matter be dropped was carried by a large majority.

UP to the present £1287 have been received by the council of the Hospital Sunday Fund at Bristol.

MEMORIAL TO THE LATE DR. MARSHALL.—The Dean of Bristol has received £400 towards erecting a memorial to the late Dr. Henry Marshall of Clifton. With this sum a tablet to the memory of the deceased has been placed in the Bristol Cathedral and the remainder has been invested. The dividends of this are to be devoted to an annual prize to be given to the best dresser of four years' standing at the Bristol General Hospital, of which institution the late Dr. Marshall was formerly consulting surgeon.

CHRONIC ARSENICAL POISONING.—At the meeting of the Tavistock Board of Guardians held on Feb. 24th Mr. C. C. Brodrick, medical officer of health of the Tavistock rural district, and Mr. A. Bowhay, medical officer of health of the Calstock rural district, presented a report upon the pauperism prevailing among families of men formerly employed in arsenic works at Calstock. They attributed this to the early age at which arsenic workers were disabled through inhaling arsenical fumes and made suggestions for their better protection while at work. The guardians decided to send copies of the report to the Local Government Board and managers of arsenic works in the district.

LITERARY INTELLIGENCE. — Sir William MacCormac will publish immediately, through Messrs. Smith, Elder, and Co., the "Hunterian Oration" which he delivered on Feb. 14th at the Royal College of Surgeons of England in the presence of H.R.H. the Prince of Wales.— G. P. Putnam's Sons announce the publication of a new quarterly journal devoted to the interests of anthropology. This periodical which has been established under the auspices of Section H of the American Association for the Advancement of Science, to which section is given over the study of anthropology will be issued under the title of "The American Anthropologist (New Series)" and the secretary and managing editor is Mr. F. W. Hodge, 1333, "F"-street, N.W., Washington, D.C.

ACTION AGAINST A DENTIST.—The case of Wilkins *v.* Hayman and Kendall was tried at the Bristol Assizes before Mr. Justice Mathew on Feb. 21st. The plaintiff claimed damages against Mr. H. Hayman, L.D.S.R.C.S. Eng., and Mr. H. Kendall, L.R.C.P. Lond., M.R.C.S. Eng., for negligence. Evidence showed that plaintiff consulted Mr. Hayman in reference to his teeth and he was advised to have some removed under ether. This anæsthetic was administered by Mr. Kendall and the plaintiff alleged that Mr. Hayman removed more teeth than he (Wilkins) agreed to and that Mr. Kendall gave too much ether and left him before he had recovered from it. Witnesses stated that the plaintiff had suffered from a severe attack of malaria contracted abroad and that after the operation there was a considerable amount of hæmorrhage and that a portion of a tooth was left in the mouth. The defence was that the dentist was authorised to remove what teeth were necessary, that the plaintiff was sufficiently recovered after the operation to speak to the defendants who had left their addresses with the patient's friends in case their services should be required. The plaintiff's friends, however, sent for his regular medical attendant. Eventually after two minutes' deliberation the jury returned a verdict for the defendants with costs.

MANCHESTER HOSPITAL FOR CONSUMPTION.—The annual meeting of this institution was held on Feb. 21st when the report of the board of management was received and passed unanimously. It stated that the total cost of the in-patient department was £1894 16*s.*, as against £2027 2*s.* 3*d.* in 1897. The increased cost was due to the fact that from Jan. 1st until July 31st the women's wards were entirely closed owing to the alterations, while no reduction could be made in the permanent staff. The open-air treatment now so generally recommended was about to be tried at the hospital at Bowdon through the liberality of the chairman. This would be one of the first hospitals in this country at which this system would be tried. The report of the medical board regarding the out-patient department stated that although the number of the total attendances of patients did not reach the record of 1894, yet the number of new patients treated was considerably above the average of preceding years. The number of new patients was 10,914.

Of these patients over 3000 were suffering from phthisis and other tuberculous affections, over 1000 from diseases predisposing to phthisis, over 2000 from diseases of the upper air-passages, and over 2000 from other diseases of the lungs. It was announced that an offer had been made to build a hospital to contain 100 beds, on the condition that it was maintained by the public of Manchester.

ROYAL ARMY MEDICAL CORPS.—The Irish candidates at the recent examination were remarkably fortunate. The Licentiates of the Royal College of Surgeons in Ireland secured first and second places together with six other places out of the 24 vacancies.

POISONING BY COAL-GAS.—The *Maryland Medical Journal* of Feb. 18th states that Dr. Robert C. Stewart, a prominent physician of Shippensburg, Pennsylvania, was accidentally asphyxiated by illuminating gas at his home. Dr. Stewart graduated at the University of Pennsylvania in 1872.

PRESENTATION TO A MEDICAL MAN. — On Feb. 18th in the board-room of Dulwich College Mr. E. R. Ray, M.R.C.S. Eng., on the occasion of his leaving the neighbourhood of Dulwich, was presented with a silver bowl and salver, together with a cheque for £116. This testimonial was largely subscribed by Mr. Ray's patients, many of whom had received his advice and attention for a period of 30 years.

THE SURGICAL HOME FOR BOYS, BANSTEAD.—The annual meeting of the above useful institution was held at Banstead on Feb. 25th. There were 21 little patients in the home, all looking bright and happy, under the excellent management and nursing of Miss Chinnery, the matron. 85 new cases had been received during the year. Only one death had occurred and that from a disease which could not have been prevented. The home contains 25 beds. The majority of the patients are sent in from London hospitals. The building stands in its own grounds. The fine, pure, dry air of Banstead proves particularly beneficial to the many cases of tuberculous disease sent to the home.

MANCHESTER'S LATEST SEWAGE SCHEME.—Mr. Baldwin Latham has estimated the cost of the proposed bacteria beds for Manchester, consisting of 60 acres, with all necessary adjuncts for dealing with the sewage from 600,000 persons, together with the storm water, at £300,000. The city will be saved from £8000 to £10,000 spent annually on chemicals, and Mr. Baldwin Latham says there can be no doubt that the proposed works will be successful and will relieve Manchester from all future embarrassment so far as the purification of the sewage is concerned. The report will be considered at the next meeting of the Council.

THE CRUSADE AGAINST TUBERCULOSIS IN MANCHESTER.—On Feb. 25th the inaugural meeting of the York Association for the Prevention of Consumption was held at Manchester. The Lord Mayor of York, who presided, was supported by Mr. Malcolm Morris, F.R.C.S. Edin., Dr. Jane Walker (London), the Dean of York, Mr. J. G. Butcher, Q.C., M.P., Dr. Tempest Anderson, J.P., Mr. F. Shann, Dr. James Ramsay, Mr. W. H. Jalland, J.P., the Rev. Canon Watson, the Rev. Canon Argles, Mr. W. Draper, the Rev. F. A. Russell, the Rev. J. S. Pawlyn, Mr. Alderman J. S. Rymer, J.P., Mr. R. Kay, Mr. W. F. H. Thomson, J.P., hon. treasurer, and Mr. H. M. Platnauer and Dr. E. Smith, hon. secretaries *pro tem.* The following rules of constitution were adopted. The methods of working are as follows: (1) Familiar and well illustrated lectures given in schoolrooms, drawing-rooms, at mothers' meetings, &c., on the prevention of phthisis and on the rules of health generally; (2) the distribution of leaflets and other forms of literature bearing upon the subject; (3) assisting the sanitary authorities in carrying out sanitary improvements by calling their attention to any particular insanitary conditions; (4) the collection of statistics and other information bearing upon the occurrence of phthisis and other tuberculous diseases; and (5) the promotion of open-air sanatoria in the district. The council of association for the ensuing 12 months will be:—President: the Right Hon. the Lord Mayor of York, *ex-officio*. Vice-presidents: the Very Rev. the Dean of York, the Earl of Feversham, Lord Deramore, the Sheriff of York (*ex-officio*), Mr. J. G. Butcher, Q.C., M.P., Lord Charles Beresford, M.P., Rev. Canon Watson, Rev. F. A. Russell, Hon. Reginald Parker, Sir C. A. Milward, J.P., the President of the York Medical Society (*ex-officio*), the Senior Member of the Honorary Medical Staff of the York County Hospital, the Senior Member of the Honorary Medical Staff of the Dispensary, the City Medical Officer of Health (*ex-officio*), Mr. J. S. Rowntree; Hon. Mrs. Wilkinson, Mrs. Edwin Gray, Mrs. Jalland, Mrs. Phillip Newman, Miss Wilkinson, Dr. Tempest Anderson, J.P., Mr. Butterfield, Dr. Evelyn, Mr. Edwin Gray, Capt. Dunnington-Jefferson, Mr. W. H. Jalland, J.P., Mr. Robert Kay, Dr. Macdonald, Dr. James Ramsay, and Rev. H. Robinson; honorary treasurer, Mr. W. F. H. Thomson, J.P.; honorary secretary, Dr. Macdonald.

CHESHIRE FARMERS AND THE MANCHESTER MILK-SUPPLY.—At the meeting of the Cheshire Chamber of Agriculture held at Crewe on Feb. 19th the Manchester proposals for securing pure milk were again criticised. The secretary, Mr. C. B. Davies, read a paper setting forth the objections in a very moderate tone. Resolutions were passed (1) in favour of any action dealing with tuberculosis in cattle being national, not local; (2) against power being granted to a local authority to enter any cowshed within the area of another local authority for examining or inspecting cows kept therein; (3) that only duly qualified veterinary surgeons be authorised to act as inspectors or examiners of cattle under these regulations; (4) that in case of temporary disease of the udder rendering milk unfit for human consumption, on recovery inspection shall take place within 24 hours of an intimation to that effect, and if the cow is healthy a certificate to that effect shall be given; and (5) that "compensation shall be paid for animals condemned by an inspector of a local authority as tuberculous and whose milk is unfit for human consumption." As first proposed the last resolution contained conditions which would have prevented some possible abuses.

WEST-END HOSPITAL FOR DISEASES OF THE NERVOUS SYSTEM, EPILEPSY, AND PARALYSIS. — On Feb. 28th the children's wards of this hospital were re-opened by Her Grace the Duchess of Devonshire before a distinguished audience of ladies and gentlemen interested in the welfare of the hospital. Her grace was present at a meeting held in the large out-patients' room at the hospital which was elegantly decorated with palms and exotics. The daughter of the chairman, Mr. G. E. Porter, having presented the Duchess with a bouquet of choice flowers, the chairman addressed the meeting, calling attention to the circumstances which led to their meeting, and after giving a brief history of the hospital which was founded in 1878 called upon the senior physician, Dr. T. Outterson Wood who drew attention to the large increase in the number of patients and the work being done at the hospital and advocated a further extension of the building to meet the increased demand for the accommodation of in-patients'. Colonel Boxall, C.B., having proposed a vote of thanks to the Duchess for her attendance, and this having been seconded by General T. W. Mercer and carried with acclamation, the Rev. F. A. Ormsby pronounced the Doxology and the meeting terminated.

Parliamentary Intelligence.

HOUSE OF COMMONS.

THURSDAY, FEB. 23RD.

Enteric Fever in India.

GENERAL RUSSELL asked the Secretary of State for India whether he could state the result of the investigations which on May 5th, 1898, he stated were then proceeding relative to the causes of the great increase of enteric fever among Europeans living in India; whether he could state the number of cases that occurred in the years 1897 and 1898 and how many ended fatally, or if he had any objection to a return being made furnishing these particulars; and whether it was true that inoculation had been widely introduced as a preventive against the disease.—Lord GEORGE HAMILTON replied: I am unable at present to add anything material to the information which I gave my hon. and gallant friend on May 5th last on the subject of enteric fever in India. The matter continues to engage the attention of the military and medical authorities. Inoculation has not, however, been adopted as a preventive. The number of cases of, and deaths from, enteric fever among the troops in India for 1897 will be shown in the report of the Army Medical Department for that year which may be expected shortly; the figures for 1898 will not be available for some time to come.

Dispensary Doctors in Ireland.

Mr. HAYDEN asked the Attorney-General for Ireland whether the Local Government Board for Ireland had acted within its powers in

issuing an order making dispensary doctors ineligible for the position of county councillor; and, if not, whether he will state the authority under which the Board so acted.—Mr. ATKINSON answered that the Local Government Board had, under the Poor-law Acts of 1837 and 1847 and 1848 and the Medical Charities Act of 1851, power to make with the consent of the Lord-Lieutenant general rules relating to the qualifications, tenure of office, guidance and control of officers of Poor-law unions and dispensary districts. Acting within this power they made the rule referred to in the question disqualifying all paid Poor-law Union officers from acting as county councillors.

Nursing in Egypt.

Captain NORTON asked the Under Secretary of State for War whether he could state the average number of trained nurses, men, and women in attendance on the British officers and soldiers who were patients in hospitals at Cairo and Alexandria between Sept. 20th and Oct. 30th, 1898.—Mr. WYNDHAM said that the average number of trained nurses between the dates mentioned were 226 men and 10 women.

English Soldiers and the Pasteur Institute.

Sir WILLIAM WEDDERBURN asked the Secretary of State for India if he would explain what were the circumstances under which nine English soldiers were sent on Oct. 8th last from Bombay to the Pasteur Institute at Paris to be treated for hydrophobia; what was the evidence in the possession of the Government showing that the dogs which had bitten these men were rabid; under what official supervision these men were sent; and whether it was true, as stated by the Director of the Paris Institute, that these nine men arrived in Paris without any credentials or anything showing when or where they had been bitten.—Lord GEORGE HAMILTON said he was aware that nine soldiers were sent from India early in October to be treated in Paris for hydrophobia but he had no information as to the circumstances. Such cases occurred not unfrequently and on this occasion the usual arrangements were made for their journey from Marseilles to Paris and for their accommodation while under treatment. He had received no complaint or representation on the subject from the Director of the Paris Institute and he should have thought that the men themselves could have been capable of explaining to the authorities of the Institute when and where they had been bitten.

The Inspection of Water-supplies.

Lord EDMOND FITZMAURICE asked the President of the Local Government Board if he proposed to introduce this session a public Bill embodying the clauses relating to inspection of water-supplies by local authorities which he proposed last year to insert in several private water Bills.—Mr. CHAPLIN replied: If I see any reasonable prospect of making progress with a Bill upon this subject I shall be quite ready to introduce it and I hope I may have the opportunity of doing so.

Rabies in Ireland.

Mr. GERALD BALFOUR in reply to a question on this subject said it was not proposed at present to suspend the Muzzling of Dogs Order in Ireland. The total number of cases of rabies throughout Ireland in the 12 months ended Dec. 31st, 1898, was 132, as compared with 162 cases in the last six months of 1897, whilst the number of cases in the first six months of 1897, before the Muzzling Order came into operation, was 335. The enforcement of the Order had consequently been attended so far with satisfactory results and it would be premature in the circumstances to revoke the Order.

Food and Drugs Legislation.

At this sitting Mr. WALTER LONG, President of the Board of Agriculture, introduced the Bill of the Government to amend the law relating to the sale of food and drugs.

FRIDAY, FEB. 24TH.

Sick and Wounded in Egypt.

In Committee of Supply Captain NORTON raised again the question of the treatment of the sick and wounded in connexion with the recent Nile Expedition.—Mr. GEORGE WYNDHAM, Under Secretary of State for War, in his reply for the Government, said he believed doubt did exist in the public mind whether all was done that ought to have been done to save the lives of our officers and men, but it was doubt not justified by the facts. The Government, he said, accepted full responsibility in the matter of seeing that the troops lent to another State went short of nothing, not only in arms and clothing, but still more in medical comforts and attendance for the wounded, and he assured the House that no question of cost entered into the matter. The hon. Member was altogether wrong in thinking that requisitions were made which were refused owing to pressure. The medical advisers of the War Office tendered their advice which in such matters was and always would be accepted. He was in a position to say that whatever view anyone else had taken their military advisers would themselves have taken the full responsibility of insisting that a hospital ship should have been sent had they thought it would have tended towards the end all must have equally at heart. While it rested with him to controvert the charge that lives were lost that might have been saved he might be allowed to say that he deeply deplored the loss of lives and feelingly sympathised with those who were left to mourn. It was, however, to make a false deduction to suggest that the number of men who died proved conclusively that they had not received adequate medical attendance. His own experience had been that the proportion of deaths from enteric fever was always very high, this insidious disease being apparently the least understood of all. As to the charge that if a hospital ship had been provided lives would have been saved, as a matter of fact there was no application made. The principal medical officer of the Army of Occupation in Egypt who was in London signified to the commander of the Egyptian Army who was also in London that he wished to have a hospital ship, but the application would have come from the General Officer commanding. This question as to whether hospital ships ought to be used and when and where they ought to be used was, he might explain, a question of old standing. No application for a hospital ship was made at the time. The General Officer commanding in Egypt said that on his return to Egypt he would consult with Lord Cromer and he would then inform the War Office whether it was necessary to ask for a hospital ship. He did not think that that could be taken as a refusal to provide a hospital ship. A hospital ship might be regarded either as a floating hospital or as a transport to be sent home when full of sick and wounded. Assuming that this hospital ship was to be treated as a floating hospital he was informed that the hospital at Cairo gave far better accommodation than could be afforded on board ship. Then came the question whether, if the hospital ship had been sent out and had been used as a transport to bring the sick and wounded home, the lives of men who had died would have been saved. That was unfounded also. The General Officer commanding in Egypt was authorised to avail himself of all passenger steamers leaving Egypt to bring home the sick and wounded. In the case of the Peninsular and Oriental line alone the steamers which left Egypt during the period covered by the charges of the hon. and gallant Member could have taken home 1000 men. The hospital ship would have had accommodation for 200 men, but under the arrangements adopted 280 men had been sent home. The hon. and gallant Member had asked how long patients had to wait before they were embarked. The average number of days before embarkation at Cairo was 26 in September, 29 in October, and 19 in November, and at Alexandria the average number of days was seven in each of those months. The question of sister nurses was a question for the officers of the Army Medical Service and they felt that there were great difficulties from the point of view of discipline in the way of placing non-commissioned officers of the service under the orders of sister nurses, or sister nurses under the orders of non-commissioned officers. At the hospital base in Egypt there were 226 men nurses and 10 women nurses—all trained nurses—for an average of 541 patients, of whom almost 150 had neither wounds nor enteric fever. He deeply regretted the lives that were lost, but he should say that after the most careful consideration of the matter he was persuaded that adequate arrangements for the sick and wounded had been made and that British soldiers were treated on this occasion as they should always be treated.

Appointments.

Successful applicants for Vacancies, Secretaries of Public Institutions, and others possessing information suitable for this column, are invited to forward it to THE LANCET Office, directed to the Sub-Editor, not later than 9 o'clock on the Thursday morning of each week, for publication in the next number.

ACLAND, H. T. D., L.R.C.P., M.R.C.S., has been appointed Assistant House Surgeon to St. Thomas's Hospital.

ADAMS, J. D., M.D. St. And., M.R.C.S., has been re-appointed Medical Officer of Health by the Yeovil Rural District Council.

AMBROSE, W. C., B.A. Camb., L.R.C.P., M.R.C.S., has been re-appointed a Clinical Assistant in the Special Department for Diseases of the Throat at St. Thomas's Hospital.

BARNES, J. A., L.R.C.P., M.R.C.S., has been appointed House Surgeon to St. Thomas's Hospital.

BELFRAGE, S. H., M.B. Lond., L.R.C.P., M.R.C.S., has been appointed Junior Obstetric House Physician to St. Thomas's Hospital.

BELL, R. H., M.A., M.B., B.C. Camb., L.R.C.P., M.R.C.S., has been appointed Senior Obstetric House Physician to St. Thomas's Hospital.

BENNETT, D., M.R.C.S., L.R.C.P., has been appointed Assistant Anæsthetist to the Royal Ear Hospital, Frith-street, Soho-square, London.

BENSON, P. L., M.D., M.Ch. Dub., D.P.H. Camb., has been re-appointed Medical Officer of Health for the Rural District of Buckingham.

BEVAN, A., L.R.C.P., M.R.C.S., has been appointed a Clinical Assistant in the Electrical Department at St. Thomas's Hospital.

BINGHAM, S. O., L.R.C.P., M.R.C.S., has been appointed House Surgeon to St. Thomas's Hospital.

BOURDAS, E. C., L.R.C.P. M.R.C.S., has been appointed a Clinical Assistant in the Special Department for Diseases of the Throat at St. Thomas's Hospital.

BRODRICK, C. C., L.R.C.P., L.R.C.S. Edin., has been re-appointed Medical Officer of Health by the Tavistock Urban District Council.

CAMERON, J., L.R.C.S. Edin., has been appointed Parochial Medical Officer and Vaccinator by the Fintray Parish Council, vice J. Christie.

COCK, M. F., L.R.C.P. Lond., M.R.C.S., has been re-appointed Medical Officer for the 9th Sanitary District, Newport Pagnell Union.

CORNER, E. M., M.A., M.B., B.C. Camb., B.Sc. Lond., L.R.C.P., M.R.C.S., has been appointed House Surgeon to St. Thomas's Hospital.

CUPPAIDGE, J. L., M.D., B.Ch. Dub., has been appointed Medical Officer for the Stoke Gabriel District by the Totnes Board of Guardians.

GAFF, J., L.R.C.P., M.R.C.S., has been appointed a Clinical Assistant in the Special Department for Diseases of the Skin at St. Thomas's Hospital.

GATES, E. A., L.R.C.P., M.R.C.S., has been appointed House Physician to St. Thomas's Hospital.

GELSTON, J. S., L.R.C.P., L.R.C.S. Irel., has been re-appointed Medical Officer by the Thetford District Council.

GOODE, H. N., L.R.C.P., M.R.C.S., has been re-appointed a Clinical Assistant in the Electrical Department at St. Thomas's Hospital.

GORDON, J. E., L.R.C.P. Lond., M.R.C.S., has been appointed Medical Officer of Health for the Salisbury Rural Sanitary District, vice J. Kelland, resigned.

HALL, J. S., L.R.C.P., M.R.C.S., has been appointed Senior Ophthalmic House Surgeon to St. Thomas's Hospital.

HOBAN, T., L.R.C.P., M.R.C.S., has been appointed Junior Ophthalmic House Surgeon to St. Thomas's Hospital.

HUNTER, W. L., M.D. Dub., D.P.H. Camb. and Eng. Conj. Bd., has been re-appointed Medical Officer of Health by the Pudsey Urban District Council.

JONES, A. W., L.R.C.P., M.R.C.S., has been appointed Clinical Assistant in the Special Department for Diseases of the Ear at St. Thomas's Hospital.

KEMPE, GILBERT, M.D., B.S. Durh., M.R.C.S., L.R.C.P. Lond., has been appointed Medical Officer of Health for the Salisbury Rural District.

KILVERT, J. E., L.R.C.P., M.R.C.S., has been appointed House Surgeon to St. Thomas's Hospital.

LAMBERT, J. R., M.B. Vict., L.R.C.P., L.R.C.S. Edin., L.F.P.S. Glasg., has been appointed Medical Officer of Health by the Farsley District Council.

LANGSTON, J. J., L.R.C.P. Irel., has been appointed Medical Officer for the No. 6 Sanitary District of the Lambeth Union.

LAVERICK, J. T. B., M.B., M.S., D.P.H. Glasg., has been appointed Medical Officer for the Lythe Sanitary District of the Whitby Union.

LUCAS, S. A., L.R.C.P., M.R.C.S., has been appointed Assistant House Surgeon to St. Thomas's Hospital.

MAYER, D., M.B., C.M. Aberd., has been appointed Parochial Medical Officer by the Dyce Parish Council.

MILLER, W. R., B.A., M.D., B.Ch., has been appointed Admiralty Surgeon and Agent for Penzance and District, vice Humphry Davey, deceased.

NOTT, A. H., CAPTAIN, M.B., M.R.C.S., L.M.S., has been appointed Clinical Assistant to the Chelsea Hospital for Women, Fulham-road, London.

PHILLIPS, H. J., L.R.C.P., M.R.C.S., has been appointed Assistant House Surgeon to St. Thomas's Hospital.

ROBERTS, K., L.R.C.P. Lond., M.R.C.S., has been re-appointed Medical Officer of Health by the Ampthill Rural District Council.

ROSS, E. H., L.R.C.P. Lond., M.R.C.S., has been appointed Assistant Medical Officer to the Infirmary, Parish of St. Mary, Lambeth.

ROSS, E. H., L.R.C.P. Lond., M.R.C.S., has been appointed Assistant House Physician to St. Thomas's Hospital.

SARGENT, P. W. G., M.A., M.B., B.C. Camb., L.R.C.P., M.R.C.S., has been appointed Assistant House Surgeon to St. Thomas's Hospital.

SCAPING, H. M., B.A. Camb., L.R.C.P., M.R.C.S., has been re-appointed a Clinical Assistant in the Special Department for Diseases of the Skin at St. Thomas's Hospital.

SINGER, H. D., M.B. Lond., L.R.C.P., M.R.C.S., has been re-appointed House Physician to St. Thomas's Hospital.

SPROULLE, A. E., L.R.C.P., L.R.C.S. Irel., has been appointed Medical Officer of Health by the Withernsea Urban District Council.

STEVENS, A. E., M.B. Durh., L.R.C.P., M.R.C.S., has been appointed House Physician to St. Thomas's Hospital.

STUART-LOW, WILLIAM, F.R.C.S. Eng., has been appointed Assistant Surgeon to the Hospital of St. Francis, New Kent-road, London.

TAYLOR, E. C., M.D. Lond., F.R.C.S., L.R.C.P., M.R.C.S., has been appointed Medical Officer for the Workhouse, Parish of St. John, Hampstead.

TAYLOR, H., L.R.C.P. Edin., M.R.C.S., has been re-appointed Medical Officer by the Smallburgh Rural District Council.

TERRY, C., M.R.C.S., has been re-appointed Medical Officer to the Nos. 1 and 3 Sanitary Districts, Newport Pagnell Union.

THWAITES, G. B., L.R.C.P., M.R.C.S., has been re-appointed House Physician to St. Thomas's Hospital.

THORP, H. C., M.A., M.B., B.C. Camb., has been appointed Assistant House Physician to St. Thomas's Hospital.

UBSDELL, HENRY, M.R.C.P. Lond., has been re-appointed District Medical Officer for Staverton and Rattery by the Totnes Board of Guardians.

WELDON, W. F. R., M.A., F.R.S., has been appointed Linacre Professor of Comparative Anatomy at Oxford, vice Professor R. Lankester.

WHITTOME, H., M.D., C.M. Edin., has been appointed Assistant Physician to the Hospital of St. Francis, New Kent-road, London.

Vacancies.

For further Information regarding each vacancy reference should be made to the advertisement (see Index).

BRISTOL CITY HOSPITALS.—Resident Medical Officer at the Ham Green Fever Hospital, Bristol, for one year. Salary £100 per annum, with board, lodging, and washing.

CHARING-CROSS HOSPITAL, London.—Assistant Anæsthetist.

COVENTRY AND WARWICKSHIRE HOSPITAL, Coventry.—Assistant House Surgeon for six months. Salary at the rate of £50 per annum, with rooms in the hospital, board, washing, and attendance.

CUMBERLAND AND WESTMORELAND ASYLUM, Garlands, Carlisle.—Junior Assistant Medical Officer, unmarried. Salary £80 a year, with board and residence.

CUMBERLAND INFIRMARY, Carlisle.—Assistant House Surgeon for one year. Salary £40 per annum, with board, lodging, and washing.

CHELSEA HOSPITAL FOR WOMEN, Fulham-road, S.W.—Registrar for three years, subject to annual re-appointment. Honorarium 20 guineas per annum.

COUNTY ASYLUM, Whittingham, Lancashire.—Junior Assistant Medical Officer, unmarried. Salary commencing at £100 per annum, increasing to £250 according to promotion, with furnished apartments, board, attendance, and washing.

DENTAL HOSPITAL OF LONDON, Leicester-square.—Assistant Anæsthetist.

DENTAL HOSPITAL OF LONDON MEDICAL SCHOOL, Leicester-square.—Demonstrator in Dental Histology. Honorarium of £25 a year.

GREAT NORTHERN CENTRAL HOSPITAL, Holloway-road, London.—Junior House Surgeon for six months. Salary at the rate of £30 per annum, with board, lodging, and washing in the hospital.

KING'S COLLEGE, London.—Assistant Aural Surgeon. Also Physician or Surgeon-in-Charge of the Skin Department.

LEICESTER INFIRMARY.—Assistant House Surgeon for twelve months. Honorarium £42, and board, residence at the Infirmary, and washing provided.

LIVERPOOL NORTHERN HOSPITAL.—Assistant House Surgeon. Salary £70 per annum, with residence and maintenance in the house.

LONDON TEMPERANCE HOSPITAL, Hampstead-road, N.W.—Assistant Medical Officer for six months. Residence in the hospital, board, and washing provided, and an honorarium of 5 guineas given conditionally.

LONDON HOSPITAL, Whitechapel, E.—Surgical Registrar. Salary £100 per annum.

METROPOLITAN HOSPITAL, Kingsland-road, N.E.—House Physician, House Surgeon, Assistant House Physician, and Assistant House Surgeon, for six months. Salaries for House Physician and House Surgeon at the rate of £40 a year, and for the Assistant House Physician and Assistant House Surgeon at the rate of £20 a year.

MILLER HOSPITAL AND ROYAL KENT DISPENSARY, Greenwich-road, S.E.—Junior Resident Medical Officer for six months. Salary £40 per annum, with board, attendance, and washing.

ROXBURGH DISTRICT ASYLUM, Melrose.—Assistant Medical Officer. Salary £100 per annum, with furnished quarters, board, washing, and attendance.

ROYAL BERKS HOSPITAL, Reading.—Assistant House Surgeon for six months. Salary £30, with board, lodging, and washing.

ROYAL COLLEGE OF PHYSICIANS OF LONDON AND ROYAL COLLEGE OF SURGEONS OF ENGLAND CONJOINT LABORATORIES.—Director of the Conjoint Laboratories.

ROYAL NATIONAL HOSPITAL FOR CONSUMPTION, Ventnor.—Clinical Assistant (qualified or unqualified) for three or six months. Residence, board, and washing provided. Applications to Mr. G. H. Parry, M.B., Resident Medical Officer.

STAFFORDSHIRE GENERAL INFIRMARY, Stafford.—Assistant House Surgeon. Salary £30 per annum, with board, lodging, and washing.

ST. GEORGE, HANOVER-SQUARE, PROVIDENT DISPENSARY, Little Grosvenor-street, London, W.—Resident Medical Officer. Salary £100, with allowance about £80, and residence at the dispensary.

SOUTH DEVON AND EAST CORNWALL HOSPITAL, Plymouth.—Assistant House Surgeon for six months. Salary at the rate of £50 per annum, with board and residence.

STOCKPORT INFIRMARY.—Assistant House and Visiting Surgeon. Salary £70 per annum, with board, washing, and residence.

UNIVERSITY OF GLASGOW.—Professor for Chair of Pathology. Normal salary £1100.

UNIVERSITY OF LONDON, Burlington-gardens, W.—Examiners.

VICTORIA HOSPITAL FOR CONSUMPTION, Edinburgh.—Resident Physician for six months. Residence and board provided, in addition to a nominal honorarium at the rate of £20 per annum. Also Non-resident Medical Officer for Out-patients for six months. Salary at the rate of £80 per annum.

WEST LONDON HOSPITAL, Hammersmith-road, W.—House Physician and House Surgeon for six months.

Births, Marriages, and Deaths.

BIRTHS.

ATKINSON.—On Feb. 25th, at Elmhurst, Hampton-hill, Middlesex, the wife of G. L. Atkinson, M.R.C.S., L.R.C.P., of a son.

COLE.—On Feb. 23rd, at Sneinton-road, Nottingham, the wife of George Cole, M.R.C.S., L.R.C.P., of a daughter.

GRIFFITHS.—On Feb. 23rd, at Andover-terrace, Cheltenham, the wife of J. Hugh St. D. Griffiths, L.R.C.P., L.R.C.S. Edin., late Surgeon R.N. of a son.

HASLEWOOD.—On Feb. 25th, at 1, Aspinall-street, Prescot, Lancashire, the wife of C. Haslewood, M.B., C.M. Aberd., of a son.

MATTHEWS.—On Feb. 26th, at Hickman-road, Penarth, Glamorganshire, the wife of Charles E. Matthews, M.D., of a son.

WYBORN.—On Feb. 24th, at Camden-road, N., the wife of W. R. Wyborn, M.R.C.S., L.R.C.P. Lond., of a daughter.

MARRIAGES.

BELL—PENRUDDOCKE.—On Feb. 28th, at St. John's Cathedral, Hong-Kong, by the Rev. F. R. Cobbold, M.A., Dr. John Bell, Government Medical Department, to Annie Elizabeth, eldest daughter of J. H. Penruddocke, Esq., late H.E.I.C.S., of Winkton, Hants (by telegram).

MORTON—MACPHERSON.—On Feb. 28th, at Christ Church, Bayswater, by the Rev. C. Ridgeway, William Britain Morton, M.D. Lond., of Brislington, eldest son of William Morton, Esq., of Gayles, Yorks, to Louisa Elizabeth, daughter of the late Hon. John A. Macpherson, of Melbourne.

DEATHS.

ARKLE.—On Feb. 22nd, at 66, Wimpole-street, W., from pneumonia, Charles Joseph Arkle, M.D., F.R.C.P., fifth son of the late Benjamin Arkle of Liverpool, aged 37.

BASS.—On Feb. 24th, at Upper Wimpole-street, W., Frederick Bass, M.D., F.R.C.S., aged 47.

FORBES.—On Feb. 23rd, Arthur Daniell Forbes, M.B., fourth son of the late Dr. Chas. Forbes, R.N., at Horsmonden, Kent, aged 33 years.

MCBRIDE.—At Arundell-villas, Weston-super-Mare, suddenly, Alexander McBride, M.D., Fleet Surgeon, R.N., aged 67.

STRUTHERS.—On Feb. 24th, at George-square, Edinburgh, Sir John Struthers, M.D., LL.D., Emeritus Professor of Anatomy, University of Aberdeen, aged 76.

WILLSHIRE.—On Feb. 24th, at Great Marlborough-street, W., Wm. Hughes Willshire, M.D., in his 83rd year.

N.B.—A fee of 5s. is charged for the insertion of Notices of Births, Marriages, and Deaths.

Medical Diary for the ensuing Week.

OPERATIONS.

METROPOLITAN HOSPITALS.

MONDAY (6th).—London (2 P.M.), St. Bartholomew's (1.30 P.M.), St. Thomas's (3.30 P.M.), St. George's (2 P.M., Ophthalmic 1.15 P.M.), St. Mary's (2.30 P.M.), Middlesex (1.30 P.M.), St. Mark's (9.30 A.M.), Chelsea (2 P.M.), Samaritan (Gynæcological, by Physicians, 2 P.M.), Soho-square (2 P.M.), Royal Orthopædic (2 P.M.), City Orthopædic (4 P.M.), Gt. Northern Central (2.30 P.M.), West London (2.30 P.M.), Westminster (2 P.M.), London Throat (2 P.M.).

TUESDAY (7th).—London (2 P.M.), St. Bartholomew's (1.30 P.M.), Guy's (1.30 P.M.), St. Thomas's (3.30 P.M.), Middlesex (1.30 P.M.), Westminster (2 P.M.), West London (2.30 P.M.), University College (2 P.M.), St. George's (1 P.M.), St. Mary's (1 P.M.), St. Mark's (2.30 P.M.), Cancer (2 P.M.), Metropolitan (2.30 P.M.), London Throat (2 P.M. and 6 P.M.), Royal Ear (3 P.M.).

WEDNESDAY (8th).—St. Bartholomew's (1.30 P.M.), University College, (2 P.M.), Royal Free (2 P.M.), Middlesex (1.30 P.M.), Charing-cross (3 P.M.), St. Thomas's (2 P.M.), London (2 P.M.), King's College (2 P.M.), St. Mary's (2 P.M.), National Orthopædic (10 A.M.), St. Peter's (2 P.M.), Samaritan (2.30 P.M.), Gt. Ormond-street (9.30 A.M.), Gt. Northern Central (2.30 P.M.), Westminster (2 P.M.), Metropolitan (2.30 P.M.), London Throat (2 P.M.), Cancer (2 P.M.).

THURSDAY (9th).—St. Bartholomew's (1.30 P.M.), St. Thomas's (3.30 P.M.), University College (2 P.M.), Charing-cross (3 P.M.), St. George's (1 P.M.), London (2 P.M.), King's College (2 P.M.), Middlesex (1.30 P.M.), St. Mary's (2.30 P.M.), Soho-square (2 P.M.), North-West London (2 P.M.), Chelsea (2 P.M.), Gt. Northern Central (Gynæcological, 2.30 P.M.), Metropolitan (2.30 P.M.), London Throat (2 P.M.).

FRIDAY (10th).—London (2 P.M.), St. Bartholomew's (1.30 P.M.), St. Thomas's (3.30 P.M.), Guy's (1.30 P.M.), Middlesex (1.30 P.M.), Charing-cross (3 P.M.), St. George's (1 P.M.), King's College (2 P.M.), St. Mary's (2 P.M., Ophthalmic 10 A.M.), Cancer (2 P.M.), Chelsea (2 P.M.), Gt. Northern Central (2.30 P.M.), West London (2.30 P.M.), London Throat (2 P.M. and 6 P.M.).

SATURDAY (11th).—Royal Free (9 A.M. and 2 P.M.), Middlesex (1.30 P.M.), St. Thomas's (2 P.M.), London (2 P.M.), University College (9.15 P.M.), Charing-cross (3 P.M.), St. George's (1 P.M.), St. Mary's (10 P.M.), London Throat (2 P.M.).

At the Royal Eye Hospital (2 P.M.), the Royal London Ophthalmic (10 A.M.), the Royal Westminster Ophthalmic (1.30 P.M.), and the Central London Ophthalmic Hospitals operations are performed daily.

SOCIETIES.

MONDAY (6th).—MEDICAL SOCIETY OF LONDON.—8.30 P.M. Dr. S. West: Some of the Clinical Aspects of Granular Kidney. (Lettsomian Lecture.) Lecture III.—Syllabus: The symptoms are late. Diagnosis often difficult. Cardiac symptoms. Hæmorrhage. Chronic Renal Toxæmia. General Cachexia. Gastro-Intestinal Symptoms, Nervous Symptoms, Respiratory Symaptoms, Renal Asthma. Skin Eruptions. Acute Renal Toxæmia=Acute Uræmia. Treatment. Conclusion.

ODONTOLOGICAL SOCIETY OF GREAT BRITAIN (40, Leicester-square).—7 P.M. Council Meeting. 8 P.M. Papers:—Mr. C. S. Tomes: A Remarkable Diseased Tooth.—Dr. F. T. Paul: A Contribution to the Histological Study of Dentine. Casual Communication: Mr. A. Bartlett: The Relief of Trouble from an Impacted Lower Wisdom Tooth.

TUESDAY (7th).—PATHOLOGICAL SOCIETY OF LONDON (20, Hanover-square, W.).—8.30 P.M. Adjourned Discussion on Pseudo-tuberculosis. The following speakers are expected to take part—Dr. Payne (President), Prof. J. MacFadyean, Mr. Foulerton, Dr. Wethered, Mr. W. C. Pakes, and Dr. W. S. Lazarus-Barlow. Lantern slides, microscopic slides, and specimens illustrating Pseudo-tuberculosis will be shown. Other Card Specimens will also be shown.

CHELSEA CLINICAL SOCIETY (Jenner Institute of Preventive Medicine, Chelsea-gardens, Grosvenor-road, S.W.).—8.30 P.M. Extra Meeting. Dr. A. Macfadyen: Enteric Fever and Diphtheria in their Bacteriological Aspects.

WEDNESDAY (8th).—DERMATOLOGICAL SOCIETY OF LONDON (11, Chandos-street, Cavendish-square, W.).—5.15 P.M. Demonstration of Clinical Cases.

MEDICAL SOCIETY OF LONDON.—7 for 7.30 P.M. 126th Anniversary Dinner at the Whitehall Rooms, Hôtel Métropole.

HUNTERIAN SOCIETY.—8.30 P.M. Pathological Evening. Specimens will be shown by Sir H. Beevor, Dr. Goodall, Mr. Oliver, Mr. Targett, and other Fellows.

THURSDAY (9th).—BRITISH GYNÆCOLOGICAL SOCIETY (20, Hanover-square, W.).—8.30 P.M. Specimens will be shown by Mr. C. Ryall and Dr. W. Ramsay. Papers: Dr. G. Bantock: The Modern Doctrine of Bacteriology, with special reference to Gynæcology.—Dr. J. Oliver: Adenoma Universale of the Endometrium.

SOCIETY OF ARTS (Imperial Institute, South Kensington).—4.30 P.M. Mr. H. A. Acworth: Leprosy in India.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.—8 P.M. Card Specimens. 8.30 P.M. Papers:—Mr. C. D. Marshall: Epithelial Implantation Cysts of the Iris.—Mr. W. Dodd: Green Vision in a Case of Tabes Dorsalis.—Mr. A. Lawson and Mr. Sutherland: Further Note on a Case of Albuminuric Retinitis in a Child.—Mr. R. Donaldson: Strabismus Fixus.

FRIDAY (10th).—CLINICAL SOCIETY OF LONDON (20, Hanover-square, W.).—8.30 P.M. Papers: Mr. B. Robinson: Hydatid Cysts of the Upper Lobe of the Right Lung and Liver successfully removed.—Mr. A. E. Barker and Dr. N. Nabarro: A Case of Pancreatic Cyst treated by Incision and Drainage.—Mr. Battle: Removal of a large Fungating Tumour of the Skull with subsequent Grafting of the Dura Mater.—Mr. A. Lane: A Case of Erasion of the Ankle-joint, illustrating a new Operative Procedure.

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

MONDAY (6th).—ROYAL COLLEGE OF SURGEONS OF ENGLAND.—5 P.M. Prof. F. G. Parsons: Joints of Mammals contrasted with those of Man.

ROYAL INSTITUTION OF GREAT BRITAIN.—5 P.M. General Monthly Meeting.

WEST LONDON POST-GRADUATE COURSE (West London Hospital, W.).—5 P.M. Mr. L. A. Bidwell: The Examination of the Abdominal Viscera.

TUESDAY (7th).—ROYAL COLLEGE OF PHYSICIANS OF LONDON.—5 P.M. Dr. G. R. Murray: The Pathology of the Thyroid Gland. (Goulstonian Lecture.)

WEST-END HOSPITAL FOR DISEASES OF THE NERVOUS SYSTEM (73, Welbeck-street, W.).—4 P.M. Dr. T. D. Savill: Electricity in the Treatment and Diagnosis of Diseases of the Nervous System.

NATIONAL HOSPITAL FOR THE PARALYSED AND EPILEPTIC (Bloomsbury).—3.30 P.M. Mr. Ballance: Surgery of the Nervous System.

ROYAL INSTITUTION OF GREAT BRITAIN.—3 P.M. Prof. E. Ray Lankester: The Morphology of the Mollusca.

WEDNESDAY (8th).—ROYAL COLLEGE OF SURGEONS OF ENGLAND.—5 P.M. Prof. F. G. Parsons: Joints of Mammals contrasted with those of Man.

EVELINA HOSPITAL (Southwark-bridge-road, S.E.).—4.30 P.M. Dr. F. Willcocks: Clinical Demonstration on Medical Cases from the Wards. (Post-Graduate Course).

HOSPITAL FOR CONSUMPTION AND DISEASES OF THE CHEST (Brompton).—4 P.M. Dr. Acland: Bronchiectasis.

THE SANITARY INSTITUTE, (Parkes Museum, Margaret-street, W.).—8 P.M. Discussion on the Establishment of Public Abattoirs in the Metropolis in relation to the Prevention of Tuberculosis. Opened by Dr. W. A. Bond.

ROYAL LONDON OPHTHALMIC HOSPITAL (Moorfields).—1 P.M. Mr. Nettleship: Retro-bulbar Neuritis.

THURSDAY (9th).—ROYAL COLLEGE OF PHYSICIANS OF LONDON.—5 P.M. Dr. G. R. Murray: The Pathology of the Thyroid Gland. (Goulstonian Lecture.)

CHARING-CROSS HOSPITAL.—4 P.M. Mr. Gibbs: Demonstration of Surgical Cases. (Post-Graduate Class.)

LONDON TEMPERANCE HOSPITAL.—2 P.M. Dr. S. Fenwick: Clinical and Pathological Demonstration to Senior Students.

WEST LONDON POST-GRADUATE COURSE (West London Hospital, W.).—5 P.M. Mr. L. A. Bidwell: The Examination of the Abdominal Viscera.

THE HOSPITAL FOR SICK CHILDREN (Gt. Ormond-street, W.C.—4 P.M. Dr. Barlow: Demonstration of Selected Cases.

ST. JOHN'S HOSPITAL FOR DISEASES OF THE SKIN (Leicester-square, W.C.).—4.30 P.M. Dr. A. Eddowes: Cases of Keloid and other Affections of Scars.

FRIDAY (10th).—ROYAL COLLEGE OF SURGEONS OF ENGLAND.—5 P.M. Prof. F. G. Parsons: Joints of Mammals contrasted with those of Man.

ROYAL INSTITUTION OF GREAT BRITAIN.—9 P.M. Prof. H. L. Callender: Measuring Extreme Temperatures.

SATURDAY (11th).—ROYAL INSTITUTION OF GREAT BRITAIN.—3 P.M. Right Hon. Lord Rayleigh: The Mechanical Properties of Bodies.

Notes, Short Comments, and Answers to Correspondents.

EDITORIAL NOTICES.

IT is most important that communications relating to the Editorial business of THE LANCET should be addressed *exclusively* "TO THE EDITORS," and not in any case to any gentleman who may be supposed to be connected with the Editorial staff. It is urgently necessary that attention be given to this notice.

It is especially requested that early intelligence of local events having a medical interest, or which it is desirable to bring under the notice of the profession, may be sent direct to this Office.

Lectures, original articles, and reports should be written on one side of the paper only, AND WHEN ACCOMPANIED BY BLOCKS IT IS REQUESTED THAT THE NAME OF THE AUTHOR, AND IF POSSIBLE OF THE ARTICLE, SHOULD BE WRITTEN ON THE BLOCKS TO FACILITATE IDENTIFICATION.

Letters, whether intended for insertion or for private information, must be authenticated by the names and addresses of their writers, not necessarily for publication.

We cannot prescribe or recommend practitioners.

Local papers containing reports or news paragraphs should be marked and addressed "To the Sub-Editor."

Letters relating to the publication, sale, and advertising departments of THE LANCET *should be addressed "To the Manager."*

We cannot undertake to return MSS. not used.

THE HOUSE SURGEON'S FEES UNDER THE WORKMEN'S COMPENSATION ACT.

THIS is a subject to which we have already referred several times and to which we shall certainly have to recur. It is one where the rights and wrongs of a difficult question can only be arrived at by the laying together of heads. The decision of any one hospital to allow certain fees to be paid to their residents cannot be made a rule for all hospitals, nor can the willingness of one insurance office to pay certain fees be quoted as a precedent to another office. But as the customs which generally prevail become generally known we feel certain that a good understanding will be established between the house surgeon (we say house surgeon as he is the officer usually concerned, but our remarks apply equally to the house physician or the resident medical officer) and such medical men as have a right to seek particulars concerning a case where compensation is in question.

In the first place, then, if a house surgeon is asked for an opinion on a case he is entitled to a fee. Whether that fee should go into his pocket or into the funds of the institution which employs him is another question and one which we will not omit to notice. But the first thing to insist upon is that the house surgeon's duties are to look after the patients under his care, to treat emergencies as they arise, and to fulfil his superior officers' directions. He is not a person to whom all and sundry may run for certificates to absent themselves from work or from school, for recommendations to employers, or for letters to charities or convalescent homes. As a rule his time is completely occupied by his discharging his just responsibilities and he is not to be treated as a jack-in-office, or as uncivil, or as ignorant because he cannot accede at once to all the requests that may be made to him. Now, whether the victim of an accident receives money from his employer or not in compensation *has nothing to do with the house surgeon* unless the governing body of the hospital have given him to understand that the matter is one in which he is to take an interest. If the governing body instruct him that he is to be ready to give all information to such medical men as have a right to ask for it upon cases of accident where compensation is in question he will, of course, do the bidding of his employers; but as the governing body in such a case would almost certainly fix a scale of fees for him he has no discretion in pecuniary matters. He gives the necessary information in return for the fixed fee and if the fixed fee is not forthcoming he refuses the information and refers his interlocutor to the governing body. But where the governing body of the hospital have not taken official cognizance of the matter at all, so that the house surgeon is free to act on his own initiative, he should try to exercise towards his medical colleagues all proper courtesy. He should not ask an exorbitant fee, but one as commensurate as he can make it with the particular demand on his time and the amount of compensation at stake. He should remember that in the higher walks of life men are constantly asked to do a little over and above that which it is their strict duty to do, and expected cheerfully to comply. It is well for the parlour-maid to object to do this or that because it is the house-maid's work, but medical men never have approached, and we hope never will approach, their obligations in this spirit. As general hints we would suggest, then—firstly, that the house surgeon should give what help he can; secondly, that he should always be paid a fee; and, thirdly, that the fee should range from 10*s.* 6*d.*, according to the demands made upon his time. A scale has, we believe, been adopted by Guy's Hospital in which 10*s.* 6*d.* is asked for a short consultation, £1 1*s.* for a longer one, and £2 2*s.* for a consultation and written report. This seems to us to be fair.

And to whom should this fee belong? We think to the house surgeon although we know that the governing bodies could make out a sound claim. The house surgeon is their officer and the fee is earned in time owned by them. But he is also a very hard-worked officer; the amount that he will gain by such fees is trifling and the work done for them is outside his strict sphere. We believe no hospital asks its resident officers to refund fees earned as medical witnesses though here the hospital suffers a distinct loss of its officers' time. We think the house surgeon should be allowed to retain the fees earned under the working of the Workmen's Compensation Act.

"EUCALYPTUS GLOBULUS."

To the Editors of THE LANCET.

SIRS,—In a letter from a Tasmanian correspondent on the above subject in THE LANCET of Nov. 12th, 1898, you summarise some of his remarks in a footnote as follows: "Dr. Benjafield gives a warning against those purveyors of drugs that sell oil distilled from other varieties of eucalyptus than the globulus. Such oils, he says, are comparatively useless." Such a statement is utterly without foundation in fact, as anyone who knows anything of the subject will admit, and it is somewhat surprising to read of a colonial medical practitioner giving expression to such a misleading statement. It is almost needless to point out that while the oil from the eucalyptus globulus is generally a very good article there are other oils on the market which perhaps more closely answer the tests of the new Pharmacopœia as well as contain a larger percentage of eucalyptol, the recognised active principle of these oils. Further, it has been quite recently demonstrated by a series of exhaustive analyses published in one of the leading drug trade journals that a large percentage of eucalyptus globulus oils on the English market will not answer all the tests of the new British Pharmacopœia, and perhaps when we consider the widely different sources from which this oil is obtained—Algiers, California, and Tasmania—and the consequent variations of season, soil, and climate, it is little wonder there should be variation in the samples examined, so that the fact of an oil being the product of eucalyptus globulus or any other variety has of itself been very wisely discarded in the new Pharmacopœia as any guarantee to its medicinal activity. One thing is certain, that while the Pharmacopœia Committee have ignored the botanical or geographical sources as a matter of little importance the stringent tests laid down by them will as certainly exclude inferior globulus oils as well as those of other species and yet will include others which do not claim to be globulus oils, but which have an already world-wide reputation for purity, excellence, and uniformity of character, not only with the British medical profession but with the leading medical practitioners throughout both hemispheres.

I am, Sirs, yours faithfully,

W. J. BROWNSCOMBE, Pharmaceutical Chemist.

Elsternwick, Victoria, Jan. 3rd, 1899.

ROENTGEN RAY OUTFITS.

Mr. G. STEGMANN, electrical engineer, of 45, St. John's-hill, Clapham-junction, S.W., has submitted to us for inspection his new list of Roentgen ray apparatus. It records several important improvements in accessories—as, for example, in the Crookes's tube and in the mercury interrupter. It is also stated that he has always a complete 12-inch installation at work in his laboratory.

"AN IMPROPER ADVERTISEMENT."

To the Editors of THE LANCET.

SIRS,—I notice in THE LANCET of Feb. 25th a letter under the above heading calling attention to an advertisement in *Lloyd's Weekly Newspaper* of a "Toothache cure" ("Ibis"), with the name of a Licentiate of Dental Surgery displayed in full. You remark that "the advertisement is one to which the attention of the Royal College of Surgeons of England or even that of the General Medical Council may well be called." I beg to state that, as published in the *British Dental Journal* of Oct. 31st last, the attention of the Council was called to the same advertisement appearing in another paper (*Answers*) and the only reply given by the Registrar was that "according to the regulations of this Council, any complaint as to improper advertising is duly considered." A correspondent of ours, Mr. L. Strangways-Hounsell, L.D.S. Eng., communicated later with the Royal College of Surgeons of England and received a reply from which the following is an extract (*British Dental Journal*, January, 1899):—

> "The Council do not possess any disciplinary powers in regard to their Dental Licentiates so as to enable them to stop advertisements such as the one you so rightly condemn. The Council cannot and do not require any undertaking on the part of those who seek the Dental licence in reference to advertising. I can only repeat that I regret, as matters stand, *there is not any redress to be obtained in this matter.*"

It would seem, therefore, that it is of little use to call the attention either of the Royal College of Surgeons or of the General Medical Council to an advertisement which is in flagrant violation of professional etiquette.—I am, Sirs, yours faithfully,

THE EDITOR OF THE "BRITISH DENTAL JOURNAL."

Weymouth-street, W., Feb. 28th, 1899.

*** We intend to join forces with the editor of our contemporary and see if this and similar advertisers cannot be prevented from disgracing the medical and dental professions.—ED. L.

STERILISATION AND THE TYPHOID BACILLUS.

To the Editors of THE LANCET.

SIRS,—Are we correct or are we not in our general belief that sterilisation of milk (usually used within a few days of the process being carried out) renders it absolutely free from any risk as to the vitality of any enteric germs it may have contained? I would ask for some authoritative pronouncement from our bacteriologists because I find that a paragraph going the rounds as to some American experiments of Messrs. Bolley and Fields (U.S. Government analysts) is having a very disquieting effect on the average hard-working, too-busy-to-read-much practitioner. You will know. It is stated that "typhoid bacteria can exist for upwards of four months in sterilised milk, and in butter (uncleansed of whey) for three months." Surely not?

I am, Sirs, yours faithfully,

FREDK. A. LEES, L.R.C.P. Lond., M.R.C.S. Eng.

Leeds, Feb. 27th, 1899.

*** In properly sterilised milk no enteric germs can be present unless it has been subjected to contamination after the process.—ED. L.

"A GENTLEMAN" AND HIS METHODS.

To the Editors of THE LANCET.

SIRS,—Your advice is so good on all matters connected with the medical profession that I may be pardoned for troubling you for it under the following circumstances. "A gentleman," L.S.A. Lond., recently sold a nucleus by means of cooking the books, making false entries &c., by which he represented that he was making £3 per week when in reality he was only taking about 15*s.* He at the same time sold the incomer drugs for which he had not paid the wholesale chemists; and here it should be mentioned, though it does not strictly concern the medical side of the case, that he left various tradespeople in the lurch

and that his taxes were obtained through the instrumentality of the bailiff and a policeman. His wife ordered dresses but neglected to pay for them.

Now, my object is not to drag the name of a defaulting brother, and so the medical profession generally, through the mud before the general public, but simply to prevent the man from continuing to defraud men who can ill afford to throw away money; for I have good reason to believe that this "gentleman" is in the habit of settling in a neighbourhood for a month or two cooking books and selling a bogus nucleus. For this purpose he makes use of your columns and possibly that of your chief contemporary the *British Medical Journal*. The facts which I state are known to my colleagues, and I enclose my name and his. Is there any way by which he can be prevented from carrying on this system of fraud? Can you and do you refuse to insert an advertisement if it should come from what you know to be a questionable source? For this is the only way which occurs to me to stop the fraud.

I fear that I have inflicted a somewhat lengthy letter upon you, but the matter is not entirely devoid of interest to the profession generally, for judging from his last venture he will so far as is possible bring the profession into bad odour wherever he may go.

I am, Sirs, yours faithfully,

Feb. 28th, 1899. B. P.

*** It is impossible for us to know the antecedents of our advertisers and the fraudulent advertisement is always made to read nicely. Where we have any suspicions we always refuse the advertisement until our suspicions are cleared up. We can assure our correspondent that the person in question will have no advertisement inserted in our columns unless he can explain the circumstances of his previous sale-transactions to our satisfaction, giving us also full opportunity to verify his statements.—ED. L.

"SUGAR-FREE WINES."

To the Editors of THE LANCET.

SIRS,—We read with very great interest your paragraph and list of "sugar-free" wines contained in THE LANCET of Feb. 25th. You are kind enough to mention our brand of Laurent-Perrier, "Sans-Sucre," but will you permit us to say that our address is 38, Leadenhall-street, not 17, Billiter-street. It is true that our premises run down Billiter-street, but the entrance is at 38, Leadenhall-street. We would further venture to remind you that the words "Sans-Sucre" are our Laurent-Perrier trade mark. You in the list apply the words to another champagne as well as to our own and no doubt this has arisen from the fact that this house did some years ago label some small quantity of their wine with the words "Sans-Sucre," but on our drawing their attention to the fact that we had registered these words they courteously consented at once to drop all use of them.—We are, Sirs, yours faithfully,

Leadenhall-street, E.C., Feb. 27th, 1899. HERTZ & COLLINGWOOD.

"WHAT IS ADVERTISEMENT?"

To the Editors of THE LANCET.

SIRS.—The newspaper article to which you draw attention has caused me much annoyance, a feeling which would have been still stronger had not its tone appealed so strongly to one's sense of the ridiculous. One morning in the preceding week a gentleman called upon me and professed great interest in the subject [of cancer, upon which he desired information for literary purposes. I answered a few questions and for any further details referred him to my published works. He told me that my name would not appear in the papers he proposed to write. I feel sure that no one acquainted with me will credit me with responsibility for the grotesque manner in which my name has been introduced or for the palpably absurd statements to which you rightly object.

I am, Sirs, yours faithfully,

HERBERT SNOW.

Gloucester-place, Portman-square, W., Feb. 27th, 1899.

*** We publish this letter with much pleasure. It will be seen that the representative of the *Echo* is stated by Dr. Snow to have obtained the interview upon false pretences and then to have broken faith with he interviewed. We understand that in some circles many things which are obviously bad manners get themselves accepted as "good journalism," but the representative of the *Echo* stands accused of more than bad manners.—ED. L.

A MEDICAL LADY'S FEES IN DISPUTE.

THE Brussels courts have had to adjudicate for the first time upon the reasonableness or otherwise of the fees claimed by a medical lady. The circumstances of the case were briefly as follows. A certain baron applied to the court for a separation from his wife on the ground of her persistent refusal of marital rights. This application being granted the lady, who was a devout Catholic, applied to the ecclesiastical authorities for a declaration of nullity of marriage, stating at the same time her desire to take the veil. The case was sent to Rome by the Archbishop of Malines and leave obtained for the lady to enter a convent on condition of proof being furnished that the marriage had never been consummated. For this purpose recourse was had to a certain medical lady who examined her and declared on oath before the ecclesiastical court that the baroness was still *virgo intacta*. The fee claimed by the lady doctor was 1000 francs which was refused on the ground that it was far more than would have been asked by the most eminent male members of the profession in Brussels. The explanation given was that it covered a large amount of work, several visits to the baroness, two journeys to Spa, one to Malines, a written report, and giving evidence before the ecclesiastical authorities. Also that the opinion of the Medical Commission had been taken upon it and that that very important professional body had considered the amount suitable. The court, however, reduced it by one-half—i.e., to 500 francs.

L. J.—All communications should be addressed to th honorary secretary of the National Association for the Prevention of Consumption and Other Forms of Tuberculosis at 20, Hanover-square, London, W. The association consists of ordinary and of life members. The subscription of ordinary members is 5*s.* annually. A donation of five guineas qualifies for life membership. The object of the association is the prevention of tuberculosis and the methods to be adopted to this end are threefold: 1. The education of public opinion and the stimulation of individual initiative by means of (*a*) a central office for the collection and distribution of information as to modes of diffusion of tuberculosis and measures of prevention; (*b*) the circulation of pamphlets and leaflets setting forth in plain language the results of scientific investigation of the above points; (*c*) public lectures by men approved by the council, addresses at congresses and other public gatherings; (*d*) coöperation with other societies having for their object the promotion of public health; (*e*) the coöperation of the public press; (*f*) periodical congresses and the issue of an annual report; and (*g*) the promotion of the establishment of open-air sanatoria for tuberculous patients. 2. The influencing of Parliament, county councils, boards of guardians, chambers of agriculture, and other public authorities on matters relating to the prevention of tuberculosis. 3. The establishment throughout the kingdom of local branches of the association.

Asterion.—From the circumstances as stated by our correspondent B certainly has a right to charge a fee, but we do not know what the rules of the institution may be with regard to A engaging in private practice. If A by any by-law of the dispensary or by the general tenor of the rules may not attend private patients he clearly should not charge fees. We would suggest that A should talk the matter over with B's usual medical adviser and take his opinion on making a charge and on what charge to make.

L.V.Sc., L.M., and S.—The Bombay Municipal Act would seem to be one thing and the Infectious Diseases Notification Act of Great Britain another. Under the latter there are certain duties to be discharged and certain fees attached; under the former there is a duty but apparently no fees. The position does not on the face of it seem quite fair, but the only remedy is repeal or alteration.

J. D.—1. There are several excellent apparatus on the market for the purpose. One convenient form is described in THE LANCET of Feb. 12th, 1898.—2. Boiling destroys tubercle bacilli with certainty.—3. The Report of the Royal Commission on Tuberculosis and Milk-Supply (Government Blue Book), published by Eyre and Spottiswoode, East Harding-street, E.C.

Physical can only consult a good surgeon or physician. He cannot find out what the board's decision will be beforehand.

Hornchurch is advised to do nothing.

METEOROLOGICAL READINGS.

(Taken daily at 8.30 a.m. by Steward's Instruments.)

THE LANCET Office, Mar. 2nd, 1899.

Date.	Barometer reduced to Sea Level and 32° F.	Direction of Wind.	Rainfall.	Solar Radia in Vacuo.	Maximum Temp. Shade.	Min. Temp	Wet Bulb.	Dry Bulb.	Remarks at 8.30 A.M.
Feb. 24	30·29	S.E.	...	67	52	36	37	38	Foggy
,, 25	30·32	S.E.	...	70	46	36	36	37	Foggy
,, 26	30·39	E.	...	72	46	31	33	35	Hazy
,, 27	30·47	E.	...	56	44	31	32	33	Hazy
,, 28	30·67	S.W.	...	59	48	28	Fzn.	29	Foggy
Mar. 1	30·64	S.W.	...	67	51	29	34	37	Hazy
,, 2	30·47	S.W.	...	71	49	35	35	37	Hazy

During the week marked copies of the following newspapers have been received: *Eastern Daily Press, Devon and Exeter Gazette, Chester Chronicle, Western Morning News, Times of India, Pioneer Mail, North British Daily Mail, Hampstead Record, Sheffield Telegraph, Scotsman, Architect, Citizen, Builder, Cambridge Chronicle, Western Daily Press, Chemist and Druggist, South Wales Echo, Bath Herald, St. James's Gazette, Cork Herald, Umpire, Yorkshire Post, Leicester Daily Post, Warrington Guardian, Liverpool Daily Post, Leeds Mercury, Brighton Gazette, Bristol Mercury, Northern Whig, Manchester Guardian, Blackburn Telegraph, Clifton Chronicle, Oswestry Advertiser, Huddersfield Chronicle, Sanitary Record, Commercial Intelligence, Temperance Chronicle, Wakefield Sentinel, Grimsby Telegraph, Madras Times, Hertfordshire Mercury, City Press, Local Government Chronicle, Bournemouth Guardian, Reading Mercury, Mining Journal, Scottish Guardian, Public Health Engineer, Surrey Advertiser, Newtownards Chronicle, Kent and Sussex Courier, Halifax Guardian, Australasian Medical Gazette, Echo, Local Government Journal, North-Eastern Daily Gazette, Evening Telegraph, Middlesbrough, Yorkshire Herald, St. Mary's Hospital Gazette, Cheltenham Examiner, &c., &c.*

Communications, Letters, &c., have been received from—

A.—Dr. J. Althaus, Lond.; Mr. H. S. Anderson, Dunmurry; Mons. J. Astier, Paris; Messrs. Allen and Hanburys, Lond.; Alliance Assurance Co., Secretary of; Mr. W. Andrews, Lond.; Mr. J. R. Armstrong, Treorchy.

B.—Dr. F. Bushnell, Plymouth; *British Dental Journal*, Editor of; Messrs. Burgoyne and Burbidges, Lond.; Mr. V. C. Bensley, Peterborough; Mr. W. H. Battle, Lond.; Bristol Sanitary Authority; T. B. Browne, Ltd., Lond.; Dr. A. G. Bagshawe, Buxton; *Birmingham Medical Review*, Publishers of; Messrs. Brampton, Birmingham; Dr. E. S. Breyfogle, San Francisco; Borough of Douglas, Town Clerk of; Mr. C. Birchall, Liverpool; British and Foreign Oxolin Co., Lond.; Dr. John Brunton, Lond.; Messrs. A. and C. Black, Lond.

C.—Mr. G. A. Clarkson, Leicester; Dr. Austin Cooper, Lond.; Mr. E. Treacher Collins, Lond.; Mr. H. P. Cheese, Lond.; Mr. N. Close, Chard; Mr. T. S. Cotterell, Bath; Dr. W. H. Campbell, Rush Springs, U.S.A.; Chelsea Hospital for Women; Cortland Wagon Co., Lond.; Messrs. E. Cook and Co., Lond.; Coventry and Warwickshire Hospital, Secretary of; County Asylum, Whittingham, Superintendent of; Messrs. A. H. Cox and Co., Brighton; Messrs. J. W. Cooke and Co., Lond.; Cumberland Infirmary, Carlisle, Secretary of; Messrs. H. and W. Cox, Leicester; Messrs. Crossley, Moir, and Co., Lond.; Messrs. W. H. and L. Collingridge, Lond.; Mr. Watson Cheyne, Lond.; Cui Bono.

D.—Mr. H. Drewry, Nottingham; Messrs. Davy Hill and Co., Lond.

E.—Mr. G. W. Ellis, Bishop Auckland; Dr. R. C. Elsworth, Swansea.

F.—Messrs. Ferris and Co., Bristol; Messrs. J. S. Fry and Sons, Bristol; F.R.C.P.; Mr. W. K. Fulleylove, Nuneaton; Dr. F.

G.—Messrs. W. Gaymer and Sons, Attleborough; Great Northern Central Hospital, Lond., Secretary of; *Gaillard's Medical Journal*, New York, Publishers of.

H.—Dr. W. K. Hunter, Glasgow; Mr. R. Huxley, Lond.; Dr. A. Haig, Lond.; Mr. J. T. Hislop, Harrogate; Mr. J. Heywood, Manchester; H. M.; Mr. W. A. Hewitson, Durham.

I.—Irish Club, Lond.

K.—Dr. R. Kirk, Glasgow; Messrs. R. A. Knight and Co., Lond.

L.—Mr. E. W. Lamb, Crewkerne; Mr. H. K. Lewis, Lond.; Luxor Hospital for Natives, Egypt; L. C.; Mr. E. M. Little, Lond.; London Association for the Prevention of Premature Burial; Mr. J. Lewis, Lond.

M.—Mr. R. Merck, Lond.; Mr. E. Morgan, Newtown; Mr. W. Monckton, Portishead; Dr. J. Macintyre, Glasgow; Dr. G. R. Murray, Newcastle; Dr. W. R. Manders, Stockport; Messrs. J. Maclehose and Sons, Glasgow; Mr. A. MacGregor, Lond.; Mr. A. Mottram, Norwich; Messrs. Macmillan and Co., Lond.; Matto, Ltd., Lond.; Maltine Manufacturing Co., Lond.; Metropolitan Machinists' Co., Lond.; Mr. R. Montgomery, Dublin; Mr. J. Murray, Lond.

N.—Norwich Medico-Chirurgical Society, Hon. Secretary of; New Hudson Cycle Co., Birmingham.

O.—Dr. Oppenheimer, Lond.; Mr. F. Orchard, Lond.

P.—Dr. J. Penny, Manchester; Pennsylvania University, Philadelphia, Librarian of; Dr. J. E. Platt, Manchester; Mons. G. Popp, Paris.

Q.—Queen Charlotte's Hospital, Secretary of.

R.—Dr. J. S. Riddle, Aberdeen; Royal Ear Hospital, Lond., Hon. Secretary of; Royal College of Surgeons in Ireland, Registrar of; Dr. Henry Rundle, Southsea; Mr. Leonard Rea, Lond.; Dr. A. Ruffer, Baroda, India; Ross, Ancrum; Dr. J. Ryan, Fiunes; R. B.; Dr. R.; Dr. Ford Robertson, Edinburgh.

S.—Mr. Howard Spalding, Lond.; Messrs. Smith, Elder, and Co., Lond.; Mr. C. D. Somers, Surbiton; Sanitas Co., Lond.; Messrs. H. C. Scales and Co., Lond.; South Devon and East Cornwall Hospital, Plymouth, House Steward of; Stockport Infirmary, Secretary of; Mr. R. F. Smart, Bristol.

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REPORT OF

The Lancet Special Commission

ON THE

WATER SUPPLY & DISPOSAL OF SEWAGE

IN

RURAL DISTRICTS

Being an Inquiry Supplementary to a Recent Commission on the Relative Efficiency and Cost of Plumbers' Work.

INTRODUCTION.

THE Report of THE LANCET Special Commission on the Relative Efficiency and Cost of Plumbers' Work, published in THE LANCET of July 4th, 1896, and subsequently reprinted in pamphlet form and extensively circulated,[1] met with such favourable acceptance that it has been deemed expedient to extend the inquiry.

Nature of Inquiry.—The former Report dealt only with town houses, where it was assumed efficient systems of public water-supply and drainage existed. It is, however, only too evident that in rural districts where no such provision exists there are a very large number of houses more or less isolated which are most inadequately provided for in these respects, and indeed are surrounded by most insanitary conditions. It is with these that the present Report deals.

The Extended Nature of the Inquiry renders it impossible to avoid taking into consideration questions that are only remotely related to the plumber, and one of the principal difficulties is to confine the discussion of these collateral subjects within reasonable limits. It must therefore be borne in mind that the object in view is to give a general outline only of the leading points.

The Importance of the Subject.—The great importance of an adequate provision of pure air and water and the influence which they exercise upon the physical and moral well-being of a people are so well known that it would seem at first sight unnecessary to call further attention to the subject. That this is unfortunately not the case the annual death-rate from preventable diseases bears a melancholy testimony.

Preventable Disease.—The mass of avoidable misery and suffering borne by thousands through the neglect of sanitary laws should surely enlist the sympathy and assistance of all. Among the preventable diseases which may be regarded as connected directly or indirectly with defective drainage or polluted water are enteric fever, cholera, diphtheria, and diarrhœa; of puerperal fever alone some four thousand deaths occur annually, and undoubtedly a certain proportion are attributable to insanitary associations. Minor ailments, such as sore throat, indigestion, headache, and a general depression of vital force, are of frequent occurrence and may often be ascribed to similar causes.

The Economic Aspect.—At the monthly dinner of the Article Club held at the Hotel Cecil in March, 1898, an after-dinner discussion on the Price of National Health was introduced by Mr. Wolf Defries, the chairman. Mr. Defries said that notwithstanding modern progress in sanitation and public health matters, among males in 1895 the six principal zymotic diseases accounted for nearly 8½ per cent. of the total mortality of the country, while tuberculosis accounted for 11 per cent. more. The minimum value of a life had been calculated by Dr. Farr at £159 per head for lives of all sexes and ages calculated on the basis of the average earnings of the agricultural labourer, from which the cost of his keep was deducted. Adopting this figure Mr. Defries showed that the country had lost in a single year—1895—£17,000,000 through preventable disease.

Instances.—The outbreak of cholera in the east of London in 1866 was properly considered by Dr. Netten Radcliffe to have arisen from the consumption of water taken from the polluted Lee.

The outbreak of enteric fever at Worthing in 1893 was traced to contamination of the water-supply by leakage of fæcal matter from the drain passing through fissures in the chalk into the well, a conclusion which was supported by Dr. Klein's bacterioscopic examination of the well water. The necessity for a frequent and regular bacteriological examination of any public water-supply, in preference to a merely chemical one, is well exemplified in this instance. Upon this outbreak Dr. Theodore Thomson reported that several chemical analyses of Worthing water, taken before as well as after the date on which the new supply was utilised, failed to detect any definite impurity in the water. It was also reported by Dr. Dupré that previously to the outbreak Professor Crookshank made two bacteriological and three chemical examinations with negative results.

The outbreak of cholera at Hamburg was traced by Professor Koch to pollution of the water from an infected vessel in the harbour combined with a defect in a filter at the waterworks. In fact, most of the epidemics within recent years of enteric fever, cholera, or diarrhœa have been traced to either the water-supply or to defective drainage, the defects in the former being frequently caused by some defect in the latter.

Cholera at Altona.—As an instance of the liability of defectively planned sanitary appliances to become a source of danger to life when surrounded by other than normal conditions, the outbreak of cholera in Altona in 1893 in a poor district named Ottensen may be given. Some of the houses were supplied with water from a well having a wooden top covered with earth and stones. Owing to the frozen state of the ground and gullies some badly polluted refuse water escaped over the surface instead of entering the drain and percolated into the well. Other houses in the same district not using the water from this particular

[1] Copies of the Report in pamphlet form may be had on application to the Manager, THE LANCET Office, 423, Strand, W.C., price 6d., or 7½d. post free.

well escaped infection. In the previous summer, when Hamburg suffered so severely from cholera owing to the polluted water-supply, this district, with the exception of two cases (one known to have been imported), was free although using the well. The sanitary surroundings were in a very unsatisfactory state. The same lesson is taught by every fresh outbreak of disease, yet but little impression is made upon those in other districts where exactly similar insanitary conditions prevail.

Apathy of the Public arises from general indifference, a dislike to any alteration in the existing arrangements, coupled with an ever-present difficulty in all questions—viz., that of cost. No doubt of late years the depression in agriculture has formed an additional barrier to rural progress in these matters. To these causes may be added the fact that with most defective surroundings those in occupation frequently continue for a lengthened period without suffering any marked decline from a normal standard of health. The chance addition of some one untoward factor, a stopped drain diverting a flow of sewage or a severe frost fracturing the side of a reservoir, may be the immediate cause of an epidemic.

Local Waterworks.—It is, however, satisfactory to know that there are exceptions to this spirit of apathy, and there are in some places land-owners and others, members of parish councils or rural district councils, who are fully alive to the importance of these questions. It is such men, generally in the face of much opposition, who avail themselves of the powers conferred by the Acts of 1875, 1878, and 1894 to establish waterworks on a small scale for the supply of their own and their neighbours' houses in cases where the individual supplies are known to be defective.

Water Analysis.—Too much reliance must not be placed upon an analysis of any water intended for drinking, for water taken from the same source at different seasons may vary in a most remarkable manner. Dr. J. C. Thresh, medical officer of health of the Essex County Council, indeed, states that he has in two samples taken from one well at the same time, but at different depths, found very different results. Heavy rains materially influence water by washing various substances into the source from which it is taken.

In submitting a sample for analysis the vessel intended to hold it must in the first place be scrupulously clean and be fitted with a clean cork or, what is better, a glass stopper. It is well also to rinse it often with some of the water to be tested. After collection it should be submitted to the chemist with as little delay as possible. It is always impolitic, not to say unfair, to the analyst not to furnish him with the very fullest particulars of the source and its surroundings from which the sample is taken for this reason. An excessive amount of albuminoid ammonia or free ammonia might not condemn the water if their presence was known to be due to vegetable decay, though the same would be considered highly dangerous if the pollution arose from an animal source, though, of course, any excessive quantity must always be regarded with suspicion. Again, the absence of these substances is no conclusive proof of the safety of a water for dietetic purposes. Also the amount of chlorine in any sample, although it might indicate original organic pollution, need not of necessity condemn a water as the organic matter present originally might have become completely oxidised, the amount of chlorine remaining constant. It must, however, be remembered that local inspection of the source of supply is the only satisfactory method of estimating the risk of pollution to which such supply is liable.

Bacteria.—Again, should a bacteriological examination reveal any specific pathogenic organisms all doubt would at once be at an end, but when the search for them has been compared to that for the needle in the proverbial haystack their non-discovery is hardly conclusive proof of their absence. Professor Koch lays it down as a working axiom that any water that holds more than 100 bacteria germs capable of development to the cubic centimetre is unsafe for drinking. This seems to leave the odds rather in favour of the enemy, but when Professor Pfuhl speaks of having counted as many as 302,400 germs in one sample c.c. the 100 or less may be accepted in a spirit of thankfulness. There would seem good reason to believe that certain micro-organisms always present in fæcal matter may, under some conditions, assume a pathogenic character.

Dairy Farms.—A knowledge of the many opportunities for the pollution of a water-supply gathered from cases that have been reported upon from time to time makes it evident how much remains to be desired. Especially is this the case with regard to the water-supply of dairy farms, which requires careful supervision. As an illustration of want of observation on the part of an inspector and the little reliance to be placed upon water analysis the following is given. A man, thirty-six years of age, was taken suddenly with gastro-enteritis; being placed upon a milk diet the symptoms rapidly became aggravated. The milk food was stopped and barley-water alone was given for forty-eight hours with marked improvement, only to be followed by a relapse on a return to milk food. The milk was again suspended with relief to the patient, but still it was not suspected, as others in the house were taking it in tea without ill effect; but when the milk was tried by the patient for the third time the connexion with the symptoms became too apparent. A change in the source of the milk-supply at once moderated the attack and a rapid and uninterrupted recovery was made. An examination of the premises from which the original milk was obtained revealed a shallow well in close proximity to a graveyard with a loam and gravel soil. The water from this well had been used for washing the milk cans. These premises had frequently been examined by the local sanitary inspector and presumably the nearness of the well to the graveyard had never occurred to him, though, as a matter of fact, they were only divided by a high wall. A few months prior to this occurrence an analysis had been made of the water with satisfactory results, but a second examination showed it to be highly contaminated. The first was made after dry weather and the second after wet. Several other cases of illness occurred in patients using milk supplied from this farm and the well was closed.

The Country Plumber.—The plumber is to a very large extent the master of the situation. This reflection possibly is not calculated to afford much consolation, more especially to those who are familiar with him in what may be termed the wild state. His opportunities for improvement have been limited, while frequently the little technical knowledge which he possesses impresses him with his own notions and bars his further progress. There are, of course, many exceptions, but the good man is as a rule drawn to the towns. When his powers for evil are contemplated a more than usual interest in his proceedings is engendered. What matters the original purity of water in a well if the plumber fixes the suction-pipe in such a manner as to allow foul surface water to flow back round the outside of the pipe into the well and pollute it? It is therefore of the greatest importance that the plumber should receive every encouragement for his improvement, as without doubt he occupies a most responsible position.

Should any considerable sanitary alterations be contemplated on a property doubtless an architect or other competent person would be consulted. In the majority of minor cases it is the local jobber, possibly a blacksmith or carpenter by trade, who makes what he considers the necessary alterations. Under these circumstances the desirability of keeping the water-supply and the sanitary arrangements as distinct as possible must be apparent to all. The plumber is, however, the man to whom attention must first be directed. Thousands of them, more or less competent, are at work in country places at the present time and it is no exaggeration to say that the result of their labours means health or sickness, life or death, to a vast number. The great difficulty is how these men are to be reached.

Plumbers' Registration, so as to ensure some measure of competency and control, offers the readiest means of grappling with the question. The Bill recently introduced into Parliament is most certainly deserving of more consideration than has hitherto been bestowed upon it.

Medical Officers of Health.—In the previous report it was suggested that the public were being educated to a right appreciation of this subject by the medical profession. Medical officers of health must still be considered our sheet-anchor and to them the public must look for any improvement and should yield them loyal support. There are many districts which active medical officers have made centres of light and learning in these matters and where their efforts have wonderfully reduced the local death-rate. It is desirable that these officers should wherever possible be free from the trammels of private practice.

Combined Drainage.—The law relating to easements is also one of great difficulty and at times a source of danger to the public health in growing districts. One cesspool is frequently shared by two or more properties and where alterations or additions are made to these buildings most undesirable complications not infrequently arise.

A common case is where the owner of a plot of land builds

a row of cottages and drains them all into one cesspool in the garden of the end house. These houses in time are sold or let on leases with the usual covenants, including one for easement.

The lessee of the end house in this case has to keep his cesspool emptied to allow the contents of his neighbours' drains to escape. When a system of public sewers is introduced the lessee cannot connect his house into the new sewer and remove the cesspool until he has first drained into the sewer each of the houses connected with his cesspool. The result is that all these connexions with the public sewer are delayed, the unfortunate lessee paying the sewer-rate for each of these houses while retaining the cesspool and postponing, perhaps, the considerable outlay required from him.

Sanitary Inspectors.—One of the principal obstacles to progress in country districts is the insufficient emolument frequently offered to candidates for these most responsible posts. The poor remuneration, combined with the multifarious and often incongruous duties they are at times expected to perform, forms a barrier to commanding the services of the most able men.

District Councillors.—Speculating builders are frequently members of vestries and parish councils. They naturally seek to have a voice upon questions affecting new roads, rates, and many other matters in which they are more personally interested than most of their fellow parishioners; their influence, however, is not always for the general welfare where sanitary questions are concerned. The position of a conscientious sanitary inspector is often one of great delicacy in connexion with property held or erected by these members, the servant finding it difficult to take action against one of his masters. There are, however, cases where the presence of a builder upon a district council or vestry is a distinct gain. The individual interests of those in authority, in small districts in particular, greatly retards any advance towards a state of sanitary efficiency. A covers his garden with stables or keeps pigs; B runs the drainage from a row of houses into one cesspool in the end house in order that he may squeeze in an extra house in place of having them semi-detached, and it will be hard if C and D cannot find some way of making themselves a nuisance to their neighbours also. The result of this is that redress is most difficult to obtain. The sanitary inspector, generally a native, follows the lead of those who should set a better example. A, B, C, &c., are afraid of each other and look over these shortcomings by mutual agreement, well understood if not expressed. Here, again, the only nope rests with the medical officer of health.

Sewage Disposal: Water-carriage.—The water-carriage system has drawbacks and grave defaults are alleged against it, but it is the readiest if not the only method for the removal of excrement under the conditions of urban life. In the matter of sewage treatment we may expect to learn much from the Royal Commission now sitting on the subject.

Judging from present knowledge it is from some form of biological filter that deliverance from the difficulties connected with sewage disposal is to be expected. It is to a more natural system that attention is now being directed, for the use of chemicals is at best but an attempt to arrest a natural process, and by so doing the assistance of those forces of nature so beneficent as allies is lost, while an effluent is obtained unsuited for purposes of irrigation.

The Dry System.—If conformity with natural laws and the practices of antiquity are accepted as guides, then without doubt where circumstances permit the dry earth system is one that deserves most careful consideration. The great difficulty to be contended with in all systems of sewage disposal is the utterly listless, almost criminal neglect shown in regard to all matters of this nature by the bulk of the population. Any attempt at a general application of dry earth-closets most frequently results in disappointment, owing, firstly, to an erroneous impression on the part of local authorities that they will receive adequate attention from the individuals who use them; and, secondly, to the want of a scientific application of the dry methods where such have been adopted by sanitary authorities. At present the land to which the excreta are carried is usually too far from the points of collection. The large pails, intended to hold a week's output from each closet, are unwieldy, weighing when full some 180 lb. Their size renders them insanitary and repulsive, while their removal is both laborious and expensive. The amount of land frequently devoted to the purpose of reception is needlessly large. Recent experiments have proved that a plot of land of 600 square yards, equal to about one-eighth of an acre, is sufficient for the disposal of the excreta of 100 persons per annum. The more central and the nearer the vicinity of the plot to the houses the less will be the expense of removal and the better the results obtained. By the adoption of some form of dry catch, such as described (pars. 144 and 209), in place of the pail and by a system of daily collection one man with a hand truck would be capable of more efficient work than two men with a horse and trolley as at present. With the dry catch much of the liquid portion is evaporated, and the remainder being absorbed by the earth the contents of the catch cease to be sloppy, the weight being materially decreased. The almost universal but absurd custom of burying night-soil deeply entirely defeats the object in view—viz., its rapid conversion into mould, whilst the practice adds greatly to the risk of polluting the surrounding water-supplies. Night-soil so treated will be found at the end of many months still in its original foul condition. All such burial must be quite superficial—in fact, merely covered with earth. When this is done it will at the end of three or four days be scarcely—if at all—distinguishable from the surrounding earth. As a manure it may be said that fresh human excreta is unparalleled. Prejudice and the inherent slowness of the pastoral mind to assimilate ideas other than those acquired in early youth will probably contribute to the long-continued use of the inevitable leaky drain and cesspool. Indeed, it were vain to expect otherwise. The adoption of a well-planned system of dry disposal by one of our large rural military depôts where such could have a fair trial might not only form a valuable object lesson to the country, but would afford excellent training to the troops in the event of active service in the field.

In place of any outlay upon main drainage and sewerage works necessitating the acquisition of considerable tracts of land for sewage farms, which last are not infrequently inadequately administered, an organised system for the daily supply of earth and for the removal and disposal of the contents of a suitable form of earth-closet would often be found more economical and sanitary. Notwithstanding the evils of the open cesspool system, with its many possibilities of water pollution, it is open to question whether the universal application of a regular drainage system in rural districts—always bearing in mind defective drains and fittings, the vagaries of the so-called plumber, and the popular belief that a water-closet is a suitable receptacle for any odd refuse—may not at times be attended with equally injurious results.

Water supply.—An efficient system of drainage and the adoption of more natural methods for the disposal of sewage than commonly prevails is the first step to command a supply of pure water. In selecting a source for a water-supply ordinary common sense on the spot, when used, is mostly to be preferred to scientific knowledge at a distance. The wish to shift a responsibility on to other than our own shoulders and the glamour attached to any special knowledge in which we do not participate often induces us to think otherwise. The inquiry tends to show that, in most cases where there is no public supply and in some cases where there is, tube wells are the most wholesome and readiest source for a supply, though these are not wholly free from risk, yet when the tube passes through an impermeable strata the risk is reduced to a minimum. Rivers and lowland streams are, on the other hand, the most objectionable as being most liable to contamination and such water should never be used unless most efficiently filtered. In cases, however, as in the supply of large towns, much more care should be exercised than generally prevails to prevent fouling above the intake. Pending a development of the question of the London water-supply an infinitely purer water might be secured for London and other riverside towns if the Conservators of the Thames and the Lee were in a better position, both legally and financially, to detect and control the pollution of the rivers under their charge.

Old Country Houses are frequently worthy monuments of the artistic skill of the architects and the integrity of the builders of past generations. It would be little to the credit of their descendants if, fired by a new-born zeal, they disfigured their buildings with forests of unsightly ventilating pipes. Where difficulties in this respect present themselves the opinion of an architect should always be sought.

Plan of the Report.—A somewhat different system has

been adopted from that of the previous report, it being found impossible to include all the necessary illustrations under a few examples. The subject is discussed under heads and the several sources of water-supply and the causes of possible pollution are taken in detail. To this is added a description of the means usually adopted for the disposal of the sewage.

One example only is given of a country mansion, but this is made to embrace a farmhouse and one or two cottages; the difference in treatment here is rather in degree than in kind. The question of efficiency has alone been dealt with, it having been found undesirable to offer any nearer approximation of prices than those already published for the town houses. This is owing to the fluctuations in the cost of labour and materials in different localities, the varying distances from towns or railways affecting the cost of cartage, &c. This may be roughly calculated at 10 per cent. advance upon London prices.

Results of the Inquiry.—The practical lessons to be drawn from the inquiry are briefly these: 1. To educate and register those employed as plumbers. 2. To bestow upon medical officers of health and borough surveyors a larger measure of independent authority than they at present possess, the interference by members of parish councils or vestries in purely technical questions being frequently attended with disastrous results. 3. The higher remuneration of rural sanitary inspectors with a view to attract more able men for the position. The same may frequently be said of borough surveyors. 4. The use of some simple form of biological filter, or the adoption of the best system of sewage treatment in all cases where the water carriage system is in use. 5. The great advantages possessed by the dry system for small or medium-sized properties for the disposal of excreta, the use of water carriage in these cases being at present almost invariably associated with cesspools and tending to soil and water pollution. 6. Additional care in the selection of water-supplies and greater regard for their protection from pollution together with provision for frequent inspection. 7. The little reliance to be placed upon any one analysis of water as conclusive evidence of its suitability for dietetic purposes and the great importance of local inspection in all cases.

THE REPORT.

1. In an investigation into a subject which, though mainly confined to plumbers' work, must of necessity touch upon most matters that relate to the sanitary condition of country houses, the difficulty of deciding what shall or shall not be included is great. The position of a house, the nature of the soil, its vicinity to water and trees may seem at first sight somewhat remote, but they influence considerably questions of water-supply, damp, and drainage. The internal plumbers' work in principle will be the same as described for town houses, but varied to meet the requirements of each case.

2. In a country house all drains connected in any way with a soil drain must be kept outside the building.

3. Water-supply will first be dealt with as briefly as possible. That this should be abundant and good in quality is one of the first essentials.

The desirability of various sources of water for domestic use are generally classed somewhat in the following order of merit:—

(1) Upland surface water after settlement in a lake or reservoir, as this water is generally impregnated with earthy matter.
(2) Deep well water from the chalk or greensand.
(3) Rain water collected on a properly prepared and enclosed ground.
(4) Land springs.
(5) Rain water collected from roof.
(6) River water.
(7) Shallow well water.
(8) Surface water from cultivated ground.

Nos. (5), (6), and (8) may be considered as extremely dangerous for dietetic purposes without previous treatment. No. (7) can only be used with safety where proper provision is made to exclude all surface or contaminated water.

4. The table given in the following paragraph on water-supplies and mortality from fever would at first glance seem to modify the above statement, but it must be remembered that the high place taken by river water as represented by London is owing to the very efficient system of filtration to which it is subjected and also to the sanitary surroundings of a large proportion of the people. Upland and moorland supplies are, on the other hand, very low down in the scale, owing in a very large measure to the defective sanitary condition of certain of the poorer districts.

5. *Water-supplies and Mortality from Fever.*—Mr. A. H. Smee, M.R.C.S. Eng., F.S.S, Chief Medical Adviser to the Gresham Life Office, in writing to THE LANCET, March 13th, 1897, gives the following. The table is the result of his investigations into the variations of the death-rate from enteric fever in several towns drawing their water-supplies from different natural sources. The calculations relate to the year 1896 and are taken from official Government statistics. The whole is of such interest that it is given *in extenso*. He says:—

"For comparison and to avoid decimals I have computed the mortality from fever per 1,000,000 living from a few typical towns the water-supplies of which are drawn from widely different sources.

Rivers and Chalk.

London	137	Paris	110

Chalk.

Lemberg	288	Epsom (mean of last ten years)	190
Rouen (and Wells; three-quarters of a year)	282	Portsmouth	153
Hull	280	Rheims	131
Norwich	193	Brighton	118
		Lille	70

Upland and Moorland.

Belfast	550	Birmingham (and wells in red sandstone)	214
Dublin	453	Leeds	213
Liverpool	322	Leicester	202
Sheffield	236	Brussels (and wells)	190
Manchester	229		
Glasgow	223		

Sand and Sand Lakes.

Copenhagen	74	Amsterdam	28
Berlin	65	Ghent	91
The Hague	38		

Limestone Water.

Linz	277	Gratz	101
Prague (and River Moldene)	214	Pilsen	91
Liége	117		

Filtered River Waters.

Magdeburg	84	Dresden	42
Hamburg	58	Frankfort	42
Cologne	49	Altona	41

Snow Water Lakes.

Zürich	104	Geneva	51
Lausanne	82		

Mountain Water.

Nuremberg	42	Munich	32
Vienna	40		

Other Sources.

Malines (shallow surface wells)	993	Charlottenburg (ground water freed from its ferruginous matter by process of exposure to air)	87
Antwerp (river water treated by iron filtration and shallow wells)	154	Bristol (red sandstone)	79
		Dorking (greensand; mean of last ten years)	70

It will be observed that towns drawing their water-supply from sands, melted snow, and rivers have a lower rate of mortality from fever than those drawing their supply from either chalk, peat, or moorland gathering ground.

"Dr. Seaton, the county medical officer of Surrey, has shown in his report on water-supplies that the mean death-rate from enteric fever for the last decade for Epsom and Sutton, which obtain their water-supply exclusively from the chalk, was at the rate of 190 per 1,000,000 living, and that this rate was an increase over the mean death-rate of the previous decade. The mortality from fever at Reigate, another chalk supply, was 160. On the other hand, Dorking, which formerly derived its water from the chalk, but now obtains its water from greensand, had a mean death-rate of 70 per 1,000,000, and shows a material diminution in the death-rate from this cause. In Chertsey, which derives its supply principally from the Thames, the mean death-rate from typhoid fever was 90 per 1,000,000 during the same period. ..... I trust that I have made out a *primâ-facie* case for an exhaustive Government inquiry as to the cause of the susceptibility to and immunity from fever amongst populations deriving their water-supply from various sources. Moreover, it is at least open to discussion whether municipal bodies, who are empowered to levy rates for sanitary administration, are suitable authorities to act as amateur managers of trading monopolies."

6. Before dealing with each of these various sources of supply in detail an enumeration of some of the principal causes of pollution to which they are liable may, in order that they may be guarded against, be briefly summarised under two heads:—

(1) Pollution prior to delivery into the house of the consumer.

(2) Contamination on the premises.

7. POLLUTION PRIOR TO DELIVERY INTO THE HOUSE OF THE CONSUMER.

(1) From sheep and cattle pastured on the gathering-ground or having access to the spring head or reservoir.

(2) Dead animals in such situations.

(3) Dogs entering reservoir.

(4) The solvent action of the water on the pipes used to convey same to house (see par. 43).

Note A.—Water charged with peat has an exceptionally rapid action upon lead owing to acidity produced by the action of certain bacteria in the earth through which it passes. It requires special provision in filtering through limestone before passing into lead pipes.

(5) The tow used in caulking the joints of iron mains (see par. 41).

(6) The house refuse of any outlying cottage on the banks of some tributary stream.

(7) Through the leakage of surface-water into the storage reservoir, either over the top or through the sides.

(8) Or by the insuction of foul water into the supply-pipe from some defective drain, cesspool, or from the surface drainage of the land.

(9) By the percolation of sea-water into wells, particularly in times of drought owing to the lowering of the water in the well below the sea-level, as recently occurred at Eastbourne.

(10) Small animals often fall into wells open at the top, together with dirt and surface drainage.

(11) Subsoil water enters shallow wells through the sides from adjacent drains, graveyards, manure heaps, cesspools, middens, especially in a porous soil.

(12) Through rat-runs between wells and drains, admitting foul air or overflow water.

(13) By men employed in digging wells, or in enlarging the bottoms of existing wells, or in fixing deep well-pumps.

(14) Foul water frequently enters wells following the course of the suction pipe.

(15) Rotting wood used in the construction of wells encourages wood-lice, &c., and fungus.

(16) Surface drainage is carried into springs and wells through fissures without having first filtered through the soil. In limestone districts water will travel in such fissures for long distances.

(17) Through the brickwork and new cement used in forming reservoirs, particularly if road-drift is used in place of sand.

(18) By leaky gas mains.

(19) In rivers and streams—manure from cultivated lands is washed in by rain.

(20) Many drains discharge sewage and factory waste into ditches that feed the streams.

(21) The refuse of houseboats and barges often thrown into rivers.

(22) By dead bodies of men and animals.

(23) By decaying wood and vegetable matter.

(24) By men, cattle, and dogs bathing.

(25) By gipsies and others camping out and washing clothes and foul linen in river.

(26) By dead birds and dead fish and refuse of picnic parties.

Most of the foregoing will be greatly aggravated in times of flood.

8. CONTAMINATION ON THE PREMISES.

(1) Cisterns without covers not only admit dirt, but mice, birds, and the remains of household pets are occasionally found in them.

(2) Ventilating pipes frequently terminate close to cisterns or their overflows or under the open eaves of the roof where cisterns are fixed.

(3) Air pipes from service boxes in cisterns supplying both closets and sinks.

(4) By waste pipes directly connected with soil drains.

(5) By broken cistern lids and felt used as a protection against frost falling into cistern.

(6) Service pipes laid in same trench with drain offer risk of insuction of foul water.

(7) By service pipes crossing under or over drains, unless especially protected.

(8) Rain water collected from a roof is liable to extra risks from soot, tame pigeons and wild birds large and small, their nests, also cats.

(9) Dead leaves and accumulation of dirt in gutters, particularly in trough gutters running from back to front inside roof.

(10) The dirty and indolent sometimes throw bedroom slops and rubbish into gutters from attic windows.

(11) Gutters are fouled at times by sweeps and other workmen.

(12) Neglected filters.

(13) Dirty sinks, especially housemaids' slop sinks, the taps of which are liable to be splashed by slop water, or have dirty house-flannels laid on them to drain often just prior to filling the drinking-water bottles.

(14) From insuction where there is an intermittent supply.

Note B.—Plumbers frequently fix in cisterns that are near sleeping-rooms a pipe on to the end of the ball valve to carry water to bottom of cistern without noise. When water is drawn from the main at a lower level this pipe acts as a syphon and will suck back the water into main from cistern, including of course any dirt that may be in the cistern at the time. Very serious cases of insuction have been recorded, including one from a public urinal.

Labourers are commonly deputed to clean out cisterns, their boots and clothes are frequently defiled by working in old drains and in removing old soil-pipes.

(15) Water becomes polluted in cisterns placed in or over water-closets, also under floors of bedrooms and in sculleries and other places to which drain air may find access.

(16) *Underground* cisterns may be contaminated by defective drains and surface-water and are liable to damage by frost.

(17) From dipping dirty bowls, &c., into cisterns and storage tanks.

(18) From the action of water upon metals, as lead, galvanised iron, or zinc, used for cisterns or pipes, lead flats, or gutters.

(19) Through the use of dirty mops or brooms in cleaning out cisterns.

SOURCES OF SUPPLY.

9. *Moorland or Upland Surface Water.*—In order of initial purity we have "upland surface water." This generally forms the source of supply in mountainous or moorland districts, where the rocks are either igneous, metamorphic, or are formed of hard millstone grit. The thin soil does not admit of cultivation, and is used only for the pasturage of sheep. The organic pollution from this source may be reckoned almost *nil*, for, unlike the lowlands, where so many sheep are allotted to each acre, here so many acres are allotted to each sheep. Occasionally one may die and decay in some out-of-the-way spot, or even fall off a rock and be drowned in a torrent bed. Even this is not such an important matter as might at first sight appear, for water that falls over rough and broken ground is very rapidly oxidised.

10. The town of Torquay, which draws its supplies from Dartmoor, has recently spent a considerable sum of money in obtaining the right to, and in enclosing, the watershed from which its supply is derived. It frequently happens that water drawn from such a source is heavily charged with peat or earthy matter and occasionally with iron, in these cases a subsidence reservoir is desirable. As already mentioned, water charged with peat acquires a considerable amount of acidity, which acts very rapidly upon metals, particularly upon lead, this action may be obviated by saturating it with carbonate of lime, which is done by passing it through a limestone filter, the only objection to this being that it adds considerably to its hardness. The experience gained from Yorkshire and other places using moorland water, should exclude the use of lead pipes (par. 43). Water containing carbonates forms a coating of carbonate of lead inside the lead pipe, which being insoluble in water prevents any further action taking place. Of course, being dependent upon such a source for a supply a reservoir is a necessity (see pars. 53 to 62).

11. The following is a digest of a short table recently

published by the Meteorological Office of rainfall during the past twenty-five years :—

Approximate Average Annual Rainfall.

England and Wales.

North-east	26·50 in.
East	26·00 ,,
Midlands	28·00 ,,
South	29·00 ,,
South-west	40·40 ,,
North-west	36·60 ,,

Ireland.

North	38·60 in.
South	39·00 ,,

Scotland.

North	52·00 in.
East	32·00 ,,
West	50·00 ,,

12. It will be noticed that the annual rainfall varies considerably in different parts, but is usually heavy in the western counties and in elevated situations. The best way to form a calculation is to take an average of the fall in any three consecutive dry years, which will very likely amount to some 30 in. The general average would be much more, but this will probably be carried over the reservoirs in times of excessive floods. The quantity collected will prove to be considerably less than the rainfall, as it is affected by the nature and inclination of the rocks, the amount of vegetation, and the evaporation. Evidence has been given before a Royal Commission which would tend to show that this is a very constant amount and not dependent upon the rainfall, the average being about 13 in. The amount lost by evaporation from an open reservoir is about 30 in. in depth per annum over the whole surface.

13. *Deep Wells.*—Deeply dug wells are perhaps the next most frequent sources of supply. They are of course subject to the same risks of pollution as the shallow ones, with the addition of the possible entrance of contaminated water through fissures at a considerable depth. The outbreak of typhoid fever at Worthing in 1894 was from this cause, while the fact that fissures were present in the well supplying Eastbourne in 1896 is proved by sea-water having entered the well. This was in all probability owing to the drought in the early summer having caused the water in the well to sink below the sea-level. It is impossible to exercise too much care to ascertain the exact character of water entering wells through a fissure, especially if situated in the neighbourhood of thickly populated districts, as water has been known to travel long distances through them without undergoing filtration; indeed many wells have had to be abandoned on this account. The subject of the geological formations which are most desirable as sources from which to draw a domestic water-supply and the character and quantity of water likely to be found in the various strata, though interesting and intimately connected with the subject, can be omitted, the opinion of an expert upon these matters being invariably taken prior to the appearance of the plumber on the scene.

14. The practice of boring at the bottom of a dug well in order to form a reservoir, as well as to obtain a position for the pumps, is now seldom resorted to. With the dug well, unless the upper stratum be an impermeable clay, iron cylinders must be sunk as far as is necessary to keep out the surface drainage, as in shallow wells, and this is frequently a costly process. In the "Tube Well System" the tube from the pump to the spring is a continuous one, and the pump itself is attached to the tube by an air-tight connexion. This removes the pressure of the air from the water in the tube. The velocity of the flow of the spring is also thereby greatly increased, the removal of the pressure of the air from the water in the tube being equivalent to a greatly increased head of water in the spring. If necessary, these pumps can be placed as low as 150 ft. or 200 ft. from the surface. There is one point which should always be kept in view—viz., that the tube throughout must be connected so that neither surface water nor sand may obtain access into it. The cost of boring such a well to the depth of from 200 ft. to 300 ft. would amount approximately to some 20*s.* per foot.

15. The publicity given by inquests held upon workmen who have lost their lives by descending wells in which carbonic acid gas has accumulated should deter others from running such unnecessary risks, but apparently such warnings are thrown away. In THE LANCET, Jan. 9th, 1897, an account is given of such a catastrophe in a well belonging to the Hastings Corporation which resulted in loss of life to one workman and nearly proved fatal to a second. The well was an open one some 60 ft. deep, lined with iron cylinders for 20 ft. down and with brickwork for the remaining 40 ft.

16. The common precaution of lowering a lighted candle into the well before descending had been neglected. It may be pointed out that it is only safe to enter a well when the flame of the candle burns with undiminished brilliancy and not only when it is not extinguished, as combustion may continue in air dangerously charged with carbonic acid. A well may be cleared of foul air by slowly lowering a bright fire in a perforated iron pail, when the heated air ascending carries up with it the heavy gas that has accumulated at the bottom, or a pail of freshly burnt lime saturated with water may be lowered, in which case the carbonic acid is absorbed.

17. In all cases where the supply is taken from a well pumps are necessary to raise and force the water into a reservoir or cisterns. The suction pipe should always receive particular attention, not only that surface water may not flow back round the outside of it into the well, but that the pipe is so supported and protected from injury in its course under the ground that no insuction of ground water may occur, such faults being very difficult of detection when they arise.

18. *Rain Water Collected from Artificially Prepared and Enclosed Ground.*—Rain water collected upon an artificially-constructed gathering ground is rather an expensive but a very satisfactory source of supply. Asphalt laid upon a concrete bed forms the best floor, the space necessary to devote to this purpose will of course be governed by the requirements of the establishment and the probable rainfall (see pars. 12 and 185). It is usually calculated from the fact that an inch rainfall yields some 22,623 gallons to the acre. It is most important that any artificial ground of this kind should be carefully fenced off, the lower part wired with netting sunk 2 ft. below the soil where it is turned outwards about 12 in. to exclude rabbits, and means must be adopted either by keeping the ground raised above the surrounding land or by forming a ditch round the same area to prevent the access of surface water.

Note C.—Rabbits in burrowing under any obstacle invariably sink a hole almost close to it and so come upon the buried wire; were it not that they were stopped by the horizontal piece forming a floor they would simply go down and under the vertical wire, but they seem to have no idea of working backwards so as to clear the 12 in. of flat wire.

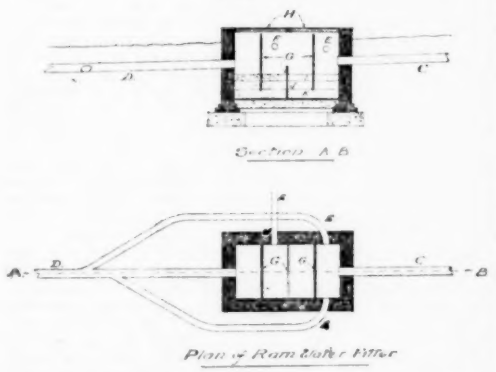
19. *Land Springs.*—Where a house is so fortunately situated as to have a constant and reliable spring in its vicinity the water can be conducted to it by gravitation if the spring is at a sufficiently high level (see par. 56). If, however, the house is higher than the spring, then it must be pumped up by means of a water-ram, a water-wheel, or a windmill (see pars. 46–49). Care should be taken to see that the spring is not fouled by cattle and small animals, or by drainage of surface water from the adjacent land. It should be railed round at least some 6 ft. from the edge, and the ground must slope away from and not towards it, as is more often the case, also as much as possible overhanging branches should be cleared from the trees that leaves may not fall into it. Should the spring be steady but small in volume an increased supply may frequently be obtained by opening up the spring head. It may, however, be found necessary to form a small reservoir (see par. 53, &c.), in which the water can accumulate in order to meet the extra demands made upon it at certain hours of the day; a storage reservoir is not otherwise desirable, at least, so far as the domestic supply is concerned. From whatever source, however, a supply is obtained a quantity should be stored at a height sufficient to give the requisite pressure for the supply of fire hydrant (see par. 56), as it is essential that these should be fixed at various points. Mostly, if a country house takes fire, it is doomed.

20. A land spring being in most cases dependent upon similar conditions for its supply as a shallow well, the caution given respecting pollution (pars. 31, 32) should be borne in mind.

21. *Rain Water from a Roof.*—Frequently an abortive attempt is made to utilise the rainfall by the construction of a cistern in the roof, into which the water from the several gutters is conducted. The common mistake is that the space allowed for storage is too small; the cistern is filled by the first shower, after which a much larger quantity runs to waste. The large area generally covered by the roof of a country house offers a favourable opportunity for the collection of a

supply of soft water, valuable for the laundry or for personal ablution. Owing, however, to its liability to pollution during the process of collection it is an undesirable source for drinking-water, unless very efficiently filtered. One of the chief causes of pollution in water so collected is, that large birds, such as pigeons, daws, starlings, as well as smaller birds, constantly build in or upon the roof of a country house. In the case of a roof with dormer windows that open on to the leads and gutters it is a temptation to the careless and indolent to empty bedroom slops out into the gutters. That this is very frequently done the accumulation to be found round the outlets to the rain-water pipe testify. Another danger is the liability of the water to absorb lead from the flats and gutters in its passage down the roof. Cats again are extremely fond of basking upon a roof, doubtless attracted by the seclusion and the chances of sport offered by the birds; their presence there is a constant source of pollution. The great advantages offered by a soft water for purposes of ablution and for use in the laundry make it most desirable to utilise the rainfall on the house roof wherever practicable. The roof of a large country house might be taken as an example, though it is equally desirable to collect it if only on a cottage. On a roof that covers 4000 ft. superficial area — not an excessive size for a country house — an average rainfall of 26 in. would yield a gross supply of 54,162 gallons. This, after 6 in. have been allowed for absorption and evaporation, an ample allowance on an ordinary roof, will give a net result of 41,662 gallons, or a daily supply for an average of fifteen persons all the year round of over seven gallons and a half per head. Where it is intended to utilise the rain water from a roof it is well to pass the water through some such rough filter as is shown in the illustration, Fig. 1,

FIG. 1.



Plan of Rain Water Filter.

which will occasionally require to be cleaned out and unless periodical cleansing is practised the filtered water may become more polluted than the unfiltered. A section is shown on the line **A-B**. **C** is a 6 in. inlet pipe, **D** the outlet, **E** storm 4-in. overflow, **F** an air pipe between slate divisions **G**. **H** is a manhole cover, **I** 4 in. of coarse gravel, **J** 6 in. of fine gravel, **K** 6 in. or more of sand.

22. The next important point is where to store this large quantity of water. In the eastern counties the provision must be greater than is necessary in the western ones, where the rainfall is more regular. Not less than a four months' supply should be provided. Not only have long periods of drought to be considered, but in cases where the number of occupants varies from time to time it often occurs, if the tank is too small, that much of the calculated supply will be lost. In the present case it will be necessary to store 14,000 gallons. To hold this quantity a tank must be built having an internal measurement of 15 ft. square by 10 ft. deep; a circular tank is more readily made water-tight. If circular, the tank would be nearly 13 ft. deep. In most cases this has to be on, if not under, the ground, as the weight of water alone, over 60 tons, is too much to place upon any building unless especially prepared. Should this water be intended for cooking or drinking purposes it is far safer to have the tank raised slightly above the ground. If this cannot be done the same care must be exercised to prevent pollution as in the case of a well (see shallow wells, par. 33), or built as shown in Fig. 20. A large proportion of the roof of a country house is over the offices and built at a low elevation, so that if the water from them has to be collected the storage tank must be at a still lower level, and the water in any case must be pumped up to a supply cistern situated somewhere in the upper part of the house. The storage tank must be properly roofed over and efficiently ventilated: as far as possible, light should be excluded to prevent the growth of vegetation (par. 182).

23. *River Water.*—Rivers and streams that pass through cultivated districts are dangerous sources from which to draw a supply of water for domestic purposes as the surface water that they collect is usually heavily charged with all kinds of organic impurities. In addition to manure washed into them by heavy rains, gipsies and others commonly camp out near a stream. For example there are two or three spots on the Thames near London that will occur to the minds of many. One a little below the "Bells of Ouseley," one at Walton, and another opposite the waterworks at Hampton. One very favourite camping-ground, where often large parties come to wash their foul linen, is by the One-mile Tree, midway between Kingston and Teddington. This last, however, is below the intake. Fortunately, in a large river like the Thames the risk is much less than would be the case in one of smaller volume.

24. It may be a picturesque sight to see some bare-footed Scotch girl stamping linen in a mountain stream, or a native of India swinging a shirt as though it were a blacksmith's hammer against a flat stone, but it is certainly a practice little conducive to the health of the unfortunates who drink the water lower down. One other source of pollution is the overflow or soakage from cesspools, and here again the Thames furnishes many examples.

25. At Sunbury, to mention one example, though happily now that a system of drainage has been completed there this source of pollution will cease, some fifty houses backing on to the river are each drained into one or more cesspools situated in the gardens. Some of the cesspools are but a few feet from the river's edge, which can be the only possible outlet for any overflow; this is much aggravated in times of flood. Again, on a small island just above the Broome-water at Teddington, during the summer from eighty to a hundred people camp, and this island, always saturated, being but little above the water line, is for this reason a most unsuitable soil to receive the excreta of such a large population and must greatly tend to pollute the river.

26. All of us who have hung on the bridge of some quiet village have felt saddened by the way in which these otherwise beautiful streams are outraged. More frequently than not they are used as the common dustbin for the village; old shreds of metal, rags of putrid clothes, and garbage of all kinds are freely flung into them. To quote the words of John Ruskin when writing in "The Crown of Wild Olives" of similar violation in the villages of Beddington and Carshalton:—

"I have never seen anything so ghastly in its inner tragic meaning—not in Pisan Maremma, not by the Campagna tomb, not by the Torcellan shore—as the slow stealing of reckless, indolent, animal neglect over the delicate sweetness of that English scene; nor is any blasphemy or impiety, any frantic saying or godless thought, more appalling to me—using the best powers of judgment I have to discern its sense and scope—than the insolent defiling of those streams by the human herds that drink of them."

Speaking of the inhabitants he adds:—

"They having neither energy to cart it away nor decency enough to dig it into the ground, thus shed into the stream to diffuse what venom of it will float and melt far away in all places where God meant those waters to bring joy and health."

Here, indeed, is an opportunity for the parish council or other local authority to benefit, not only their own village, but every other through which the same stream flows. There used to be, and probably there still are, villages in which a very primitive form of semi-public water-closet might be seen. It consisted of a long rail in lieu of a seat projected horizontally slightly over the stream, supported by means of some forked stakes. One of these villages suffered from a severe outbreak of typhoid fever in 1872.

27. It must be considered therefore highly dangerous to use water from such sources for dietetic purposes unless most efficiently filtered. The danger of such a source of supply has been well exemplified in the outbreaks of typhoid

fever which have occurred more than once at Lynn, in Norfolk. The supply was drawn some few miles down from the spring head of a small stream which had previously passed through a district partly marshy and in parts highly cultivated. Local opinion, it is true, is or was divided as to whether this water-supply might fairly claim to have been the original cause, or whether it was not due to the defective state of the drainage of the town. Of course, in such a case it would be almost invidious to give too decided an opinion; but if only a part of the charges made against the drainage system are true it may be assumed that honours are divided, while the report of the Medical Department of the Local Government Board did not leave much doubt on the subject. The outbreak already referred to at Hamburg is another example. Without discussing the question at any great length an allusion to some of the points to which Professor Koch draws especial attention when writing upon water filtration may be of service.

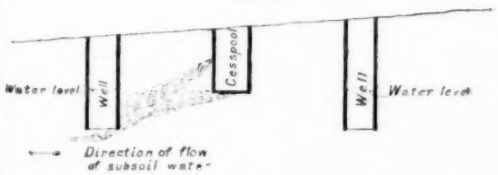
28. Of sand filtration he says: "We are compelled to admit that even under the most favourable circumstances it cannot afford absolute protection against infection, though it does afford a protection with which, considering the practical conditions of life one may rest content." He gives 30 cm. (slightly less than 12 inches) as the minimum depth for the sand layer; all dissolved matter passes through the filter. The most efficacious medium in the filter is the layer of slime deposited upon the top of the sand by the water, and this layer after a certain time, more or less according to the condition of the water and the number of bacteria present, becomes incapable of action. In summer water is particularly full of micro-organisms and this just at a time when most water is required; these clog the filter often in a few days. As a rule filters have not sufficient rest allowed them. When filtration becomes too slow this layer of slime must be removed, and until enough water has passed through to form a fresh layer of this material the effluent should be run to waste, an average of twenty-four hours being given as the time required to form this necessary layer. Thus it appears that it is one of the first essentials that this layer of slime should in no wise be disturbed while the filter is in action; this presents some difficulty as the entrance of the water, especially at first, is calculated to cause considerable commotion in the sand.

29. The rate of flow through the filter is another point that requires careful regulation. This rate is frequently calculated by a comparison of the quantity filtered in the twenty-four hours with the superficial area of the filter. Such a calculation is misleading, as the rate of flow will vary at different hours of the day according to the demands made upon the reservoir. Professor Koch gives as a maximum rate 100 millimetres per hour per square metre; he also considers that every three days the water should be bacteriologically examined, and when epidemics are imminent, or with open filters, in times of severe frost this should be done daily. In the latter case an exposed filter naturally would be rendered useless. As already stated filtered water containing more than 100 germs capable of development per c.c. should not be allowed to enter the pure water reservoir, and due provision for diverting such water should be made.

30. *Shallow Wells and Surface Water from Cultivated Ground.*—These are the commonest and in many cases the most polluted sources of supply. Their source is often surface drainage or shallow springs fed by the same. In small properties the well and the cesspool are often near neighbours. The soakage from the highly cultivated kitchen garden, the farmyard, the manure heaps, and even at times the churchyard, all adds its quota to the water in the well, as on analysis the presence of free ammonia, nitrites, and nitrates, will frequently testify. Again, small and sometimes even large animals fall into wells that are open at the top. Rats have a faculty of burrowing straight to water and will frequently make a tunnel from the old drain in which they live to the nearest well and thus form a most undesirable means of communication between them. Where, however, due care is exercised in amending their construction shallow wells may be retained and they are capable of yielding a wholesome supply.

31. The depth from the surface to which it is necessary to render a well impervious to water will depend upon the geological formation and the level of the ground water. In a light sandy soil a greater depth will be necessary than in one of a heavier character. When the ground water-line is only a few feet from the surface the well should have an impervious lining to a depth of at least 9 ft. or 10 ft. The position which the well occupies in relation to any building or possible source of pollution is also of considerable moment. The flow of the subsoil water at any given point being always in the direction of the nearest natural outlet, when such exists—as a spring, stream, or sheet of water—it is evident that the purer water will be found before it passes such possible point of pollution. For this reason, in the case of two wells situated but a few yards from each other, one may yield a pure water and its neighbour one highly contaminated (see Fig. 2).

FIG. 2.



32. It should certainly be an absolute rule that no drain, cesspool, midden, or manure heap should be within, say, fifty feet of the well, and in a gravel or very porous soil this distance should be exceeded. Again, the depth of a well affects the drainage area, for when the water in it is many feet deep the removal of this water by pumping has often a very far-reaching influence, in proportion, of course, to the density of the surrounding soil.

33. There are several ways of providing an impervious lining to a well. One is by forming a couple of single brick rings built in Portland cement and rendered on both sides in cement for a distance of some 10 ft. or 12 ft. below the surface of the soil more or less according to its permeability. This brickwork should be carried up to 12 in. above the ground level, care being taken to well puddle the space between the brickwork and the surrounding earth with clay. A second method is to reduce the opening of the well at the necessary depth with brickwork gathered over to support two or more lengths of stout cast-iron pipe 2 ft. in diameter, these to be fitted with caulked lead joints securely embedded at bottom and puddled with clay round the outside where it rests upon the brickwork, the ground round the well to be carefully rammed down at intervals, a few feet only being done at one time. There are to be obtained stoneware pipes for this purpose like enlarged drain pipes. When these are used they should be jointed in cement and puddled round the outside with clay as in the case of the brick rings.

34. It must, however, always be borne in mind that very severe frosts are liable to cause a fracture, and at such times the upper part of the well should be examined. Where good water is to be found at a depth not exceeding 150 ft., an "Abyssinian" tube-well will be found the least costly means to obtain a supply. They can be used to advantage in such soils as gravel, coarse sand, and chalk, but their use in clay soils, marls, or fine sand is not satisfactory. They cannot be driven through rock. The cost of such a well, say 100 ft. deep with a tube of 2 in. internal diameter, would be about £40. A well 20 ft. deep would probably not exceed £10, but this, of course, would depend upon the locality. Any well where the water is more than 25 ft. from the surface should be fitted with a deep well pump. There is far less risk of pollution in this form than in a dug well, provided the tube is perfect.

35. In some situations where a better supply of good water is obtainable at a lower level, an artesian well might be sunk at the bottom of the existing well, which can then be filled up. Professor Koch, in his book on Cholera, advises, on economic grounds, that all shallow wells fitted with pumps in dangerous situations should be filled up, first with coarse gravel and then with fine sand, so as to form a filter bed; the sand in such cases should be 15 ft. deep, with the perforated end of the suction pipe bedded in the gravel. The level of the ground round all wells, more particularly dug wells, should slope from and not towards the mouth, to prevent the entrance of surface water. A good plan is to enclose them in a small well-house. The pump should be within the enclosure, with only the handle and the spout accessible from the outside.

36. Another plan, and for some reasons a better one, is to have the pump fixed some little distance from the well, the top of which projects above the ground and is covered by a

large stone or iron joists and concrete cemented to render it watertight. In this case care must be taken with regard to two things:—

(1) That surface water cannot enter the well by falling back round the outside of the suction pipe.

(2) That should the distance from the well be considerable, the suction pipe must be of sufficient diameter to provide for friction in the horizontal pipe.

METHODS OF PURIFYING WATER.

37. *Domestic Filters.*—There are two principal actions that assist in the purification of water when passed through a properly constructed filter. The first is the mechanical straining of the solid particles present. The second is the oxidation of any organic matter by the atmospheric air contained in the pores of and the interstices around the medium used. Of the many filters that have been made those only dependent upon the efficient straining of the water are in any way reliable, and of these two only are known to be perfectly so, judging from a bacteriological standard. Most carefully constructed filters will, however, if constantly attended to, improve and purify water to some extent, but a neglected filter is worse than useless, fouling water instead of cleansing it.

38. *Boiled Water.*—For a private house dependent upon a doubtful source for its supply there is no protection equal to that afforded by boiling the water for ten minutes. To do this without some special contrivance is both expensive, troublesome, and unsatisfactory, inasmuch as it imparts to the water a flat and insipid taste, and although it may render it safe it certainly makes it very unpleasant.

39. In THE LANCET of Jan. 2nd, 1897, an account was given of the Lawrence process of softening and sterilising water by means of a condenser. For domestic purposes in particular this apparatus, it is said, has the advantage of being cheap, light, very portable, and not liable to get out of order. It is made in various sizes to boil from 12 to 150 gallons of water per hour; it is easily worked at a small cost; and either gas, oil, or a coal fire may be used for heating it. After careful experiments it was found to yield excellent results, the water being perfectly clear and bright, palatable yet soft to the taste, while above all it gives absolute security against infection from any water borne disease.

40. *Hard Water.*—It is scarcely necessary to dwell upon the desirability of the use of soft water in preference to hard. Economy, if nothing else, recommends it. There is a waste of two pounds weight of soap used in every 100 gallons of water that has 16° of hardness as calculated by Clark's process. Vegetables when cooked in it turn yellow and peas shrivel, but in soft water their colour is retained. Hard water compresses the pores of fresh meat boiled in it, while soft water has the opposite effect and acts as a solvent. The common cause of hardness in the water arises from the presence of bicarbonate of lime, also of sulphate of lime and sulphate of magnesia. Clark's process of softening water is the system commonly adopted by water companies who draw their supplies from the chalk. In pure water chalk is only soluble to a very slight extent, enough to impart some two degrees of hardness, but in water which holds free carbonic acid gas in solution 1 lb. of chalk can be dissolved in 560 gallons of water by 7 oz. of the gas. It is also soluble in water from an almost opposite cause—viz., by depriving the chalk of carbonic acid gas, as when it is converted into quicklime by heat. In burning 1 lb. of chalk 7 oz. in weight is lost by the loss of the carbonic acid gas driven off, the remainder, consisting of 9 oz. of quicklime, is then entirely soluble in 40 gallons of water. Clark's process takes advantage of this. The water to be softened which contains the 1 lb. of chalk per gallon is mixed with water containing 9 oz. of quicklime per gallon, when the 7 oz. of free carbonic acid gas which held the first 1 lb. of chalk in solution combines with the 9 oz. of quicklime to form 1 lb. of chalk, and this together with the first 1 lb. of chalk now no longer soluble owing to the loss of the free carbonic acid gas is precipitated at the bottom of the tank. This process is convenient and simple enough when applied on a large scale, but it is troublesome to apply for private use. There are several domestic contrivances which take Clark's process as a basis. (See also pars. 23 and 29.)

WATER-MAINS.

41. All mains should be of cast-iron, and where placed on land or made ground must be laid upon a cement concrete bed to avoid fracture by settlement and also should be protected from contact with brick or plaster rubbish containing lime which is likely to corrode the pipes. Where laid under roads they must be bridged over to prevent damage by heavy traffic. All mains should be kept at least 3 ft. below the surface of the ground to preserve them at an equable temperature. With long lengths of iron pipe it may be necessary to provide expansion boxes. In laying large cast-iron mains the joints are made by packing them with yarn and then running in molten lead, afterwards driving this home with an iron caulking tool; care is required that none of the yarn is allowed to get inside the main, and as little should be used in each joint as possible. Water passing through very long mains may become contaminated through the decay of the yarn used in the joints; for many reasons it is desirable to tar all mains internally to prevent rust. Dr. Angus Smith's is the process most desirable, the pipes being coated internally with a form of black enamel while hot immediately after casting. Owing to the large amount of oxygen present in very soft water rust will very often form in masses that greatly diminish the discharge from the pipes. Difficulties frequently present themselves in laying long mains owing to the contour of the ground, and levels in all cases must first be carefully taken. No loss of head will arise through the pipes following the contour line provided they do not rise above the level of a line drawn from the highest to the lowest point. This line is called the hydraulic mean gradient. Should they do so air will accumulate at this point and loss of head will result. It should not be forgotten that a slight loss of head is caused by every bend in proportion as it is more or less acute. In deciding the size and thickness of iron mains the following points have to be taken into consideration: (1) the quantity of water required per minute; (2) the height of head; (3) the length of main for friction; (4) the height to which a jet of water is required to be thrown for fire hydrants. This last is greatly influenced by the size and shape of the nozzle used, the same head of water giving a jet greatly varying in height with different sized nozzles. It is impossible to offer in a few lines any general rule for guidance as the several factors vary in almost every instance. With a little care by the help of a few good hydraulic tables the difficulty can be surmounted. The enormous loss of pressure by friction in long lengths of small pipes is a point too often lost sight of.

42. *Underground Waterpipes* in the vicinity of houses should be protected by being enclosed in a brick channel to prevent the risk of fracture when excavating at any subsequent time. They should never be laid in the same trench by the side of a drain, or cross one if it can possibly be avoided; should they do so they must be still further enclosed in a wooden trough filled in with pitch and be made to cross above the drain.

43. The use of lead pipes is most convenient for small mains and service pipes for house fittings, but the practice is one of too general application in view of the varying quality of the water in different localities. Iron pipes must be substituted for lead where the water is free from carbonates owing to the solvent action of soft water upon lead (see par. 10). Tin lined lead pipes found considerable favour for use with very soft water when they were first introduced, but owing to the fact that the lead was found to be acted upon by the tin they proved to be useless. The joints had to be made by means of brass connexions, and the tin lining having a much lower melting point (442° F.) than the lead pipe (617° F.) the soldering on of the brass connexions often leads to the melting of the tin. The cost of fixing also rendered it unsuitable for general use. More recently another endeavour has been made to overcome the difficulty by introducing a coating of asbestos between the lead and the tin, thus keeping the metals apart, while the non-conducting properties of the asbestos permit a plumber's ordinary joint to be made without melting the tin, but the risk from galvanic action between the tin and the lead remains.

44. In the use of iron pipes for hot water free from carbonates, as no fur is deposited on the insides of the pipes, the water is frequently discoloured by rust, being saturated with iron, so that in laundries, where a soft water is most desired, the circulating and service pipes should be of copper, or the clothes will suffer from iron mould. Where galvanised pipes are used the water becomes impregnated with the zinc, though after some little time this effect passes away.

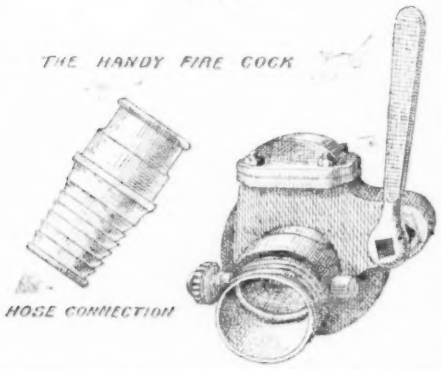
45. *Fire Hydrants.*—It frequently happens that a house is dependent more or less for a supply of water in the event of

a fire upon a lake or stream situated at a lower level; in this case the suction pipes should be laid to the most convenient points at which an engine could work, so as to save the delay and confusion likely to arise in laying a hose from a distance. In reference to these pipes the question of friction must not be overlooked. In all cases where the water reaches the hydrants by gravity it is of paramount importance that the valves should be of the simplest construction and unlikely to become set fast through neglect. The means of connecting the hose should also be of such a character that a novice, however agitated, cannot become involved in any difficulty.

In the event of a fire everything depends on the promptitude with which the first supply of water is brought to bear upon the outbreak. Every minute is of the greatest value. Wheel valves are liable to become set when not in frequent use, and when this is so some confusion may occur, the operator being uncertain as to which way the wheel should be turned; time is also lost in turning the wheel before the valve can be completely opened.

With a full-way lever cock with a long handle, such as the handy straightway valve shown in the illustration, this is obviated. The hose connexion (Fig. 3) is also much better

FIG. 3.



adapted for private use than the regulation screw pattern. Being a spring connexion it only requires to be pushed into the socket provided in the valve with one hand, whilst with the other the lever of the valve is pulled down. The valves and connexions should be fitted in addition with screw threads of a pattern to fit the hose in use in the local fire brigade. Besides the hose connexion shown, which is largely used, there is another patent of very similar construction, but it has a slight disadvantage, as the coupling cannot be so readily undone by one man and the latch joint is not quite so complete.

In addition to the constant supply to the hydrants which should be fixed both inside and outside the house a supplemental one is sometimes obtained by pumping directly into the hydrant mains, in which case some provision may be necessary to prevent the water from being forced back into the supply tank or by the use of a pressure augmenter.

METHODS OF RAISING WATER.

46. The best means of raising water to a storage-tank depend upon so many local conditions and are so varied in their character that they can only be referred to somewhat briefly.

47. *The Ram.*—Where such a supply is derived from a stream a water-ram is at once the simplest and most economical engine to use, provided the height to which the water is to be raised does not exceed some 150 ft. With any height much above this the amount of water wasted in proportion to that raised is excessive. A ram cannot be used with a less fall than 12 in., and one greater than 6 ft. is not desirable owing to the strain and consequent wear of the ram. A ram will not raise water to a greater height than that of twenty-five times the height of the fall given, in practice it is usual to keep well within this limit. The fall necessary to raise a given quantity of water depends upon the volume available in the stream or reservoir, the friction due to the length of delivery pipe, and the height to which the water has to be raised. Rams are made capable of utilising from 50 to 80 per cent. of the available power. The makers will be found always ready to supply the necessary information as to the required fall and size of ram upon being furnished with the requisite particulars. The difficulty is not so much in obtaining the required head of water to work the ram; this is easily got by sinking the chamber in which it is enclosed into the ground at a short distance from the stream from whence the water is conducted in a stout iron pipe; the trouble is rather in disposing of the waste water, which usually has to be returned into the stream at a lower level or may be utilised to work a second ram.

48. *Water Wheels.*—In cases where a ram cannot be used a water-wheel will frequently be found the most suitable means available for obtaining power to raise water up to a building. The power thus obtained has the advantage that it is capable of being utilised to raise water from a source other than the stream working the wheel. For instance, where the water in a stream is unsuited for domestic use water may be conducted from it in a pipe to a distance to work a turbine wheel, from which power can be obtained to work a deep well or other pump, the waste water after working the turbine being carried into the nearest natural outlet.

Another, and in some cases a more convenient, method is to fix the turbine or other wheel directly in the stream, the turbine working a dynamo; the electrical power thus obtained is easily transmitted to any distance.

49. *Windmills* may often be used with advantage, but where this is done the reservoir must of necessity be larger. The power being intermittent it is usual to calculate an average of 30 per cent. as the time the mills will be at work; the more exposed and open the position they occupy, of course, the better will be the result. The sails of these mills are circular in shape and their size is calculated from the horse-power desired and the average velocity of the wind in feet per second.

50. *Pumps.*—Pumping by manual labour is a slow and unsatisfactory process. Horse and steam power are mostly available on a farm.

51. *Portable Steam Engine.*—There is a light and portable engine to be obtained with pump attached mounted on a four-wheeled carriage. It can be used in the event of a fire to increase the pressure of the delivery from the hydrants by connecting to them or to the standard suction pipes as already described, or amongst other purposes it can be used for pumping into a tank from a well by means of the driving wheel and belt with which it is fitted.

52. *Stationary Engines* suitable for pumping are made not only for steam, but for gas, oil, hot air, and electricity.

WATER STORAGE.

53. In the formation of a reservoir several things have to be considered: the probable daily consumption to be provided for, the annual rainfall, and the loss from absorption and evaporation. No advantage is to be derived from the storage of good water in a reservoir unless such water is already impregnated with iron or earthy matter, in which case it will be improved by exposure to the air and cleared by subsidence.

54. *Effect of Sunlight.*—Experiments show, on the one hand, that direct sunlight acts upon water so stored by tending to destroy bacterial life to a depth of five feet, certainly a most desirable result; but, on the other hand, it also encourages vegetable growths. Such growths, though they may at first improve the water by reducing the nitrates present, afterwards tend to deteriorate it by decay and by promoting insect life.

55. *Effect of Exposure to Air.*—As an instance, water from deep-seated springs and wells which contain but few microbes per c.c. will in a few days after exposure in a reservoir contain many thousands. A great distinction must be drawn, however, between such a water and one impregnated with sewage, though the number of microbes present might be the same in each, those present in the reservoir being in all probability non-pathogenic. In a reservoir the sides should as far as possible be perpendicular, or nearly so, to discourage the growth of vegetation. With this form the difficulty of rendering them watertight is greater.

56. *Hydrant Reservoir.*—Where a reservoir is essential for a domestic supply it is of course a great saving of expense to use the same for the fire hydrants. The objection to this arrangement, however, is that the pressure requisite for the hydrants is very undesirable for the fittings for the domestic supply, necessitating additional strength in the pipes and

brass work and frequently causing much noise and vibration when taps are turned off. As to the quantity necessary to be retained for this last purpose it must depend not only upon the size of the house or farm buildings but also upon the facilities that exist for replenishing the reservoir in the event of an outbreak. Where a reservoir is used for the dual purpose the domestic supply should be taken in a separate pipe connected with the reservoir some distance from the bottom; by this means a reserve will always remain in case of fire. The probable quantity required in case of fire is generally taken at 300 gallons per minute for two hours, which would require 36,000 gallons, but this must depend upon the extent of the premises. The height at which the reservoir is fixed and its distance from the house will greatly influence the size of the hydrant mains, the friction in mains of varying diameters and lengths greatly affecting jets of water from the same head (see par. 41). This very obvious fact is one frequently lost sight of and is the cause of much disappointment and useless expense. If dependent upon rainfall the reservoir should be able to hold about one-third of the annual supply.

57. A reservoir, in addition to the points already mentioned, will be influenced somewhat as to size and character according to the source from which it is to receive its supply, whether it is dependent upon the rainfall or a deep-seated spring, or if it has to be charged by pumping from a well or stream.

58. *Impounding Reservoir.*—In the case of impounding water in a gully formed by some mountain stream an excellent plan is to build one or more walls across the channel. Care must be taken that the dam be placed upon the rock so that no water can escape under it; if this cannot be done an embankment will be found preferable. It will be necessary in the case where there is a chain of reservoirs to provide sluices in the upper walls to recharge the lower reservoir when it is exhausted; the sides also of the channel must be carefully examined and all fissures or other possible means of leakage stopped. The outlet of the supply pipe should be taken from the side in preference to the end of this reservoir, and it is well to make some provision by means of a float or otherwise to discharge all surplus storm water through a by-pass and not over the top of the dam. The same precautions are necessary to protect this basin from pollution by cattle, &c., as were recommended for a spring-head (see par. 19).

Note D.—Full particulars as to proportions of embankments, height, and width of sides, bywash slope, &c., will be found in Rawlinson's Rules for Water-supply, "Spons' Builder's Price Book."

59. *Brick-built Reservoir.*—Where no facilities exist for utilising a natural basin or the rain water has to be collected on a roof or artificial gathering ground a reservoir should be built to receive the water. The bottom of the tank should be above the level of the surrounding ground to avoid risk of pollution, though it may be advisable that the retaining walls should be strengthened by an embankment of earth in order the better to resist the pressure and also to maintain an equitable temperature. It is better to divide the reservoir into two or more compartments connected with each other and with the inlet and outlet pipes by valves; this facilitates the execution of any repairs, particularly in such cases where the domestic supply is drawn off some distance from the bottom of the tank. It admits of any one section being cleaned without interference with the general supply to the house. The tank is covered over with iron joists and concrete after the manner of a fireproof floor, and is then cemented or asphalted on the top (see Table of Rainfall, par. 185, also Fig. 20).

60. *Evaporation.*—Bearing in mind, as already stated, that the amount of evaporation from an exposed body of water is on an average some 30 in. annually in depth over the whole surface, the deeper the reservoir can be made in proportion to its exposed superficial area the better. Vaporisation also being dependent upon the temperature of the air, its density, deepness, and stillness, it follows that the cooler and less exposed to draughts the air above the water can be kept, the less loss will be sustained on this account; the loss can be reduced to about 6 in.

61. Dr. Dalton gives the following as the result of some experiments of evaporation from water surfaces:—

March	0·33	inches per day.
April	0·56	" "
May	0·75	" "
June	0·63	" "
July	1·22	" "
Hottest weather	2·00	" "

62. *Elevated Tanks.*—In some cases where no suitable natural elevation exists on which to build such a reservoir it will be necessary to erect one or more large iron tanks upon some sufficiently strong building of brick, iron, or wood, always bearing in mind that in addition to the weight of the cistern each gallon of water stored at a temperature of 60° will weigh about 10 lb. There are, again, other instances where the original source of supply is at such an elevation and distance from the house that it may be desirable to bring the water down in steps by means of a chain of smaller reservoirs, so shortening the mains and relieving the pressure. In such cases each main must be under control by means of a valve. In some districts—such as chalk or rock formations—always bearing in view the chances of pollution, an open reservoir may be formed by simply puddling a depression or excavation made in the surface with clay.

63. *Small Properties.*—In small properties the collection and storage of sufficient rain water for domestic purposes presents greater difficulties owing to cost than in larger ones. Certainly underground tanks might be formed, as is the custom in some places, and these, if circular in shape, can be made very sound if lined with cement, which can be done at a small expense, the water being drawn by a pump. Such tanks, however, are liable to great risks and much sediment always collects in them, though if it could be assured that the water would only be used for purposes of washing they would afford a valuable adjunct to a purer supply.

64. *Daily Consumption.*—In towns and manufacturing districts it is very difficult to arrive at a correct average of the consumption of water per head of the population, as it depends so much upon the occupations and surroundings of the people, also upon waste through defective fittings. At an inquiry by one of the Royal Commissions on Water-supply the late Mr. J. Simpson, whose name is so closely associated with water in connexion with the dairy interest, gave a list of fifteen towns in which the average quantity was twenty-one gallons for domestic purposes, whilst Mr. Bateman supplied a list of eight or ten towns in which the domestic supply was twenty-five and a half gallons per head per day, and recent experience has done nothing to modify these opinions.

65. The eight large companies supplying London collectively have a daily average of some thirty-one gallons per head of the population, varying individually from nearly twenty-seven to forty-eight gallons; but much of this is used for municipal and manufacturing purposes, while the waste is considerable, some companies finding it cheaper to pump the extra water required than to detect and stop the waste. In a private house where due care is exercised to avoid waste from fifteen to twenty gallons per head per day will be found to be a liberal allowance.

DRAINAGE.

66. *Sewage Disposal.*—The disposal of the solid excreta and urine in sewage by means of water carriage is in thickly populated towns a matter of necessity. In the case of isolated houses and small villages the use of water for this purpose may be considered a doubtful expedient.

67. *The Internal Water-closet.*—Where a desire for increased convenience or a spirit of emulation has induced the occupier of a rural dwelling to introduce an internal water-closet, the course usually adopted has been as follows: the open midden in the garden, the sides of which are mostly formed of dry brickwork, is converted into an enclosed cesspool, from which an imperfectly jointed drain, more often than not built of bricks with flat top and bottom, is led up to the house. Here, in some dark and ill-ventilated cupboard, what is looked upon as one of the more fashionable water-closets, usually of the pan variety, is placed, the result often being to bring sickness or death into what may hitherto have been a healthy house.

68. *Cesspools.*—The question what to do with sewage is a problem the solution of which has of late years exercised the minds of many, and this system of carrying it into, and storing it in, a cesspool or chain of cesspools, there to ferment and develop what is capable of being injurious to health, is undoubtedly the worst possible way.

69. *Overflow of Cesspools into Streams.*—The common practice of conducting the overflow from a cesspool into a lake or stream if within easy access is greatly to be condemned.

70. *Open Middens.*—The only other method at all in general use is the open midden. Where this is situated some little distance from the house, and sufficiently removed from the well or other source of water-supply, though objectionable,

it is to be preferred to the enclosed, badly constructed, and badly ventilated cesspool upon sanitary grounds; being exposed to the air, and as a rule merely a hole dug in the ground, evaporation is rapid, and moreover it contains comparatively little moisture. In many parts of Devonshire, and doubtless in other counties also, closets are constructed bridging across some small stream, and such an arrangement is looked upon by the happy possessor as a great achievement. Possibly, so far as this individual is concerned, it is very satisfactory, not so, however, for the people dependent upon the stream for their water-supply lower down.

71. *Internal Cesspools.*—The occupiers of the smaller or medium class of houses, although they may suffer from the foul air from a cesspool when delivered into their house through a defective brick or pipe drain, are better off than their more wealthy neighbours in this respect. In the larger of the old country houses it was a common practice to build the cesspools *inside* the house, and it must be admitted that their construction is often a splendid example of the bricklayer's craft. In re-arranging any sanitary system in an old house search should always be made for cesspools in the neighbourhood of the bottom closet or soil pipe or in the cellar under these. Recently a cesspool was found under the floor of a large West-end mansion containing not less than seven or eight tons of solid soil. The house had been drained into the sewer many years ago and the builder who did the work was contented to only break in the top of the cesspool and cover it over with some dry rubbish.

72. In the large majority of old country houses cesspools are to be found, if not immediately underneath the house, at all events in very close proximity, the air from the cesspool being frequently drawn into the house when the fires are lighted. The distance that air may be drawn by a fire in old houses where the space under the floors and the hollow partitions, pipe casings, and wall panelling are connected together is very remarkable. This fact may frequently be noticed when search is made for the origin of some escape of drain-air, smoke, or gas.

VARIOUS METHODS OF DISPOSAL.

73. It will be better briefly to treat in order the several methods in use for the disposal of that which in the vicinity of the house cannot but be considered a nuisance: (1) the water-closet system, in connexion with cesspools to be periodically emptied or used for the purpose of irrigation; and (2) the deodorising system, either by the application of earth or chemicals.

74. The first system and certainly one which finds almost universal favour with the householder, being from this point of view the most convenient, is that of water carriage, the various so-called dry systems requiring more or less daily supervision. In either case there is a large quantity of liquid waste to be disposed of, as by eliminating the discharge from the water-closets not much more than three gallons per head per day out of a possible twenty gallons is diverted, the drainage from stables and farm buildings remaining in addition.

75. *Water-carriage.*—The water-carriage system had therefore better be first dealt with and may be thus divided into seven heads, which will serve to illustrate the means at present in vogue:—

(1) Where the whole of the crude sewage is passed on to large tracts of land, which is called broad irrigation.

(2) Where it is passed on to small tracts of land previously provided with subsoil drain and generally termed intermittent or downward filtration.

(3) Where the solid portion is precipitated either mechanically or chemically in tanks and the effluent after being again chemically treated or filtered is either passed out on to the land or is at once discharged into a stream. Of this nature is the so-called "Ferozone process," in use at Acton. The Native Guano Company in their works at Kingston-on-Thames treat the sewage of a population of some 42,000 upon a similar system. This process is installed at Wellington College.

(4) Where the whole of the sewage is passed through a strainer and the solids so caught are periodically removed and the liquid portion is either discharged on to the land or disposed of by a system of sub-irrigation.

(5) Biological filters alone or where the sewage is first passed through some form of "septic tank" and the effluent is filtered and discharged into a stream or passed on to the land.

(6) It is undesirable to pass sewage from a single private house direct into the *sea*, as for this system to be satisfactory much depends upon the set of the currents. Any attempt to carry out such a scheme properly is usually attended with great expense.

The foregoing six divisions will broadly include all the several systems in common use, though these consist of a great variety, varying in detail one from the other.

(7) Lastly, there is the old arrangement of cesspools.

76. *The Dry System.*—The second or deodorising system in which the solid excreta from the closets is dealt with apart from the liquid sewage consists mainly of the following:—

(1) Earth closets in various forms.

(2) Dr. Poore's dry catch system.

(3) The direct collection into vessels containing disinfectants.

To take the several systems in detail as applicable to the present subject.

77. (1) *Broad Irrigation* may be dismissed as being altogether unsuited to the requirements of a single house or estate. For this reason, unless the land available is well adapted for the purpose and is, moreover, of considerable extent in proportion to the quantity of sewage to be disposed of, the solid constituents present are apt to choke the pores of the earth, rendering it "sewage sick" and incapable of assisting irrigation (see par. 99). This system may, of course, be greatly helped by a suitable provision of subsoil drains and it is then called intermittent or downward filtration, No 2.

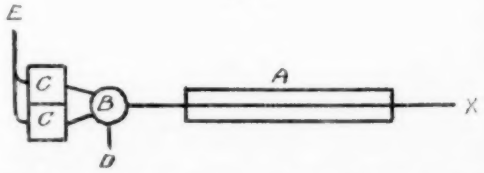
78. (2) *Intermittent Filtration* is, on the other hand, a simple and, on the whole, a satisfactory means of dealing with any considerable volume of sewage from a large estate or public institution. The land necessary to devote to this purpose may be taken in proportion of not less than an acre to every hundred of the inmates—rather more is perhaps desirable. This land is divided into plots, upon each of which in turn the stream of sewage is directed. No single dressing should be of a less quantity than one inch in depth over the whole surface of the plot, so that it becomes necessary to accumulate perhaps a week's sewage for this purpose. The size of the collecting tank and also that of the plot to be dealt with will of course be in due proportion, governed by the number of gallons available, reckoned at twenty gallons per head per day of the inmates. These plots should be six or eight in number in order that sufficient time may elapse between the dressings. The discharge is usually conducted on to the land through an annular syphon, the action of which is automatic, only the necessary attention being required to divert the stream towards the desired plot (see par. 198). The subsoil drains that collect the effluent are laid at various depths and distances according to the nature of the soil (see pars. 183 and 198). One hundred tons of sewage is required to cover one acre of land one inch in depth, which is the quantity considered necessary for each dressing, or about 22,600 gallons.

79. (3) *Where the Solids in Suspension are Precipitated.* This is effected in two ways, either by allowing the sewage to settle unaided in tanks or the processes are accelerated by the admixture of certain substances, as alumina, that fall to the bottom and entangle and carry down the more solid particles of the sewage at the same time, also to some extent acting as purifiers. The Public Health Act, 1875, requires every local authority (now the district council) to purify sewage before discharging it into a stream (Section 17). The Rivers Pollution Acts of 1876 and 1893 have also done something to prevent the indiscriminate pollution of streams, but on the whole their effect has been disappointing and the machinery provided by the Joint Rivers Boards is more hopeful. The various processes that aim at accomplishing the purification of sewage are far too numerous even to enumerate. The principle in all is invariably the same, the difference consisting in the means used. A short description of one or two systems will suffice to give a good general idea of them all.

80. The diagram (Fig. 4) shows roughly the working of the apparatus, the dimensions of course being approximate. The whole construction may be below ground if desired. A is a mixing place, into which the precipitants are thrown; B a Candy patent sewage tank; and C C, polarite filters. The sewage passes into A, where it is treated with ferozone, which contains ferrous iron salts, salts of alumina and magnesia, finely divided porous magnetic oxide of iron and finely powdered polarite,

which contains besides the foregoing silica and lime. From A it falls into the circular tank B, where precipitation takes place, and the sludge is raised by the Candy patent automatic apparatus and caused to flow out at the outlet D into a trench, where it is dug into the ground directly or removed and put upon the land. The supernatant liquid, which is fairly clear, overflows the sewage tank B into the filters C C composed of coarse gravel intersected by drain pipes laid upon the filter bottom;

FIG. 4.



above this is 4 in. of fine gravel, then 6 in. of sand, then 10 in. of polarite mixed with sand, and on the top 9 in. of sand. The effluent passes out at E. The above system, though chiefly applied to the sewage of towns with varying success, has also been adapted to the requirements of an ordinary house with but few inmates. There is practically no effluvium provided the small amount of necessary attention is given, the chief point being the disposal of the sludge. In the case of a small property the effluent is dealt with by a system of subsoil drains as described for system No. 4, provided the fall of the ground will allow.

81. The one objection to any treatment of sewage with chemicals is that it produces certain precipitates that delay nitrification and retard its assimilation by vegetation. Sewage so treated is always liable to secondary decomposition. The filters require to be cleansed and their contents renewed at intervals.

82. Another plan is that of the A.B.C. process, so called from the initial letters of the precipitants used—viz., alumina, blood, clay, and carbon. This method has been applied with success at Kingston-on-Thames and Aylesbury on a large scale and has been found equally successful when devoted to the purposes of a country mansion. There can be little doubt upon two or three points connected with this system: first, that the operation can be conducted without serious offence or detriment to health in a populated neighbourhood; secondly, that the guano produced has a definite market value of £3 10*s.* per ton; thirdly, as to the character of the effluent, in regard to which, before a select committee of the House of Commons upon private Bills, Professor J. Dewar, himself a member of the Royal Commission on the Water-supply of the Metropolis, in effect stated, in answer to questions 923 and 924, that he had examined this process in use at Kingston and was of opinion that such an effluent might safely be admitted into a stream provided the volume of water in the stream was sufficiently large and the water was not immediately intended for drinking. He thought in the case of the effluent at Kingston (which is some 1,200,000 gallons daily) that "it might pass into the Thames with perfect safety." It is, of course, the qualifying question of the possibility of the water ultimately being used for drinking purposes that renders the discharge of such effluents objectionable without having been previously passed on to the land, unless it discharges into a river below any point from which water for drinking is likely to be drawn. The case of a small effluent from a single house discharging, say, from 100 to 500 gallons daily would be different and the effluent might safely be turned into a ditch prepared as described in par. 211, as this amount would soon be absorbed, provided this ditch was at all points removed some fifty or sixty yards from any well or stream.

83. The Kingston Works on the foregoing principle may be thus described. The crude sewage in its passage to the pump well first passes through a screen, which intercepts all matters likely to clog the pumps; here it is treated with the deodorising and purifying mixtures B.C. It is then raised by means of three centrifugal pumps driven by a powerful engine into a meter chamber and a record taken of its volume. From here it passes into the settling tanks, on its way receiving A., the alumina, which assists the process of clarification by the formation of a flocculent precipitate, the specific gravity of which is slightly heavier than water. The stream is not arrested in its passage through these tanks but passes out into the Thames comparatively clear. These tanks are periodically cleared of the sludge by means of pumps into a well, from which the sludge passes into accumulators by the creation of a vacuum and is then forced by air pressure at 100 lb. to the square inch into filter presses on the first-floor of the building, whence it is removed in hard cakes. These pressed cakes are dried in a drying cylinder, with a fan and condensing apparatus attached, ground into powder, bagged, and sold as native guano at £3 10*s.* per ton. Besides the foregoing arrangements there are two mortar mills for grinding the chemicals and two vats for dissolving the precipitants. Owing to the necessary outlay upon buildings and plant such a system could only be available for a large institution or mansion or where water power was obtainable.

84. (4) *Sub-irrigation.*—This system is a convenient one for a small house possessing a moderate-sized garden, provided that the ground intended to be sub-irrigated be situated a few feet below the level of the basement of the house to be drained. The system may be adopted omitting the catch pail, but the drain is then more liable to clog and occasionally the syphon tank will require cleansing from the sludge. The house drain after leaving the disconnecting syphon trap falls into a small brick ventilated chamber, access to which is obtained by means of an air-tight iron cover; in this chamber is suspended a galvanised wire pail, which retains the soil and paper from the water-closets. This catch chamber may be situated at any point as most convenient between the disconnecting chamber and another, formed either of brickwork or iron, and capable of holding some 300 gallons of liquid, in which latter is fixed an annular syphon. This syphon when the tank is full discharges its contents into a subsoil drain formed as follows: a close-jointed 4 in. drain pipe is laid from the outgo of the syphon, having on alternate sides junctions 8 ft. apart. This drain may be laid upon dry bricks put crosswise. Into the junctions are inserted branches consisting of ordinary 3-in. agriculture drain-pipes laid some 10 or 12 in. below the surface of the garden patch, also upon a bed of bricks or paving tiles, laid crosswise and flat. Each pipe is bedded upon a dab of mortar, care being taken not to squeeze any into the joints, and a similar dab is placed upon the top of each joint, thus leaving all of them open at the sides. When the syphon discharges, the whole being covered by some 4 in. of rubbish, the liquid oozes out between the sides of the joints of the agricultural drain pipes. These pipes will last for a number of years without attention; should they become choked either by accumulation or by roots it is a very simple matter to take up, clean, and relay the subsoil drain if care is taken not to disturb the bed upon which they rest. The wire pail will require to be emptied and its contents dug into the ground about once a week, not less. The objection to this system is that the drainage enters the soil below the level of greatest bacterial activity and the liquid is chiefly dependent upon the mechanical action of the earth for purification.

85. (5) *Biological Filters.*—Every age is dominated by some impressive discovery and possibly the researches into biology within the last ten years have done more to revolutionise our ideas upon things generally than the knowledge acquired in any similar preceding period of time. No fairy tale told by credulous peasant of the "little people" who labour for the good or punish the wrong-doer ever exceeded in wonder the recent revelations of science. The final and satisfactory disposal of sewage in the presence of a rapidly increasing population is a subject that has an ever-extending influence, not only upon the health, but upon the habits and wealth of a community. However much for purposes which we believe to be advantageous we defer the return of such sewage to the land this must be its ultimate destination. If the land is to be reproductive that which is taken from it must be returned in order to complete the cycle. This theory, though fully admitted in the case of stock and straw, is entirely ignored in the case of human beings and for this the system of water carriage as applied to sewage is chiefly responsible.

86. It is now well known that there exist in nature certain non-pathogenic organisms divided into two classes and named respectively anaerobic and aerobic, whose function in life, under the conditions that their name implies, is to convert the solid portions of animal excreta and effete

organic matter ultimately into a gaseous and liquid form by a process of digestion.

87. The following facts, though within the knowledge of readers of THE LANCET, have such a direct bearing upon sewage disposal and water pollution that they must not here be omitted. The ultimate end of all inert organic matter is to be converted into inorganic substances through the agency of bacteria in order to be re-assimilated by other organisms, both animal and vegetable, and if by well-intentioned, though possibly a short-sighted policy, this end may be deferred it cannot be prevented. To secure the most favourable conditions for the development of those organisms whose beneficent action is desired should be the aim of the sanitarian.

88. The process of decomposition is carried out by different classes of bacteria under varying conditions in two distinct ways. Dr. Sims Woodhead, director of the laboratories of the Royal Colleges of Physicians of London and Surgeons of England, gives the following facts: "The first process is the result of the activity of organisms that are capable of taking up their oxygen from the air, and, second, those the result of the activity of organisms that so break up and rearrange the organic molecules containing oxygen that not only do they, the bacteria, take up oxygen themselves, but they allow of its being handed on to the products to which in their process of metabolism they give rise. It is probable that here we have to do, not only with nascent oxygen, but that we have certain products set free during the process of decomposition which seize upon oxygen with very great avidity. This decomposition or re-arrangement is spoken of as a process of nitrification or a conversion of the nitrogenous elements into ammonia, nitrous and nitric acids, carbonic acid, and water, or, speaking more generally, it may be said to be a process of mineralisation of the organic forms of nitrogen, phosphorus, carbon, and hydrogen, during which they become finally oxidised or mineralised to nitric acid (HNO_3), phosphoric acid (H_3PO_4), carbonic acid (CO_2), and water (H_2O)." It would appear that the decomposition of organic matter buried in the soil takes place apart from any process of putrefaction, which latter is not only offensive but dangerous to health, and the action is more rapid near the surface of cultivated ground where the soil is porous and readily permeable both to air and water. Here are found the micro-organisms of the aerobic class, whose number is prodigious. As the organic matter is washed down deeper into the soil it is seized upon by the second or anaerobic class of microbes who, unable from their situation to obtain free oxygen, have developed the power of acquiring it from other substances which are broken down by them into simpler forms; below a certain depth bacteria are absent. The depth is given by Dr. Sims Woodhead as twelve feet, the number present, however, a long way before this depth is reached must be very limited, though this of course varies again with the nature of the soil, its moisture, porosity, temperature, and the amount of organic matter usually present on the surface. Antiseptics or heat (100° C.) at once arrest such chemical change.

89. The formation of nitric acid in organic earth mixtures varies with the amount of oxygen present. According to Miller and Boussingault nitrification is absent in earth thoroughly saturated with moisture and from which the air is excluded, whilst without the presence of oxygen the nitrates in the earth are reduced. Many of these facts, by the way, were pointed out by Dr. G. V. Poore in a lecture at the Sanitary Institute in 1887 entitled "Shortcomings in Modern Sanitary Legislation."

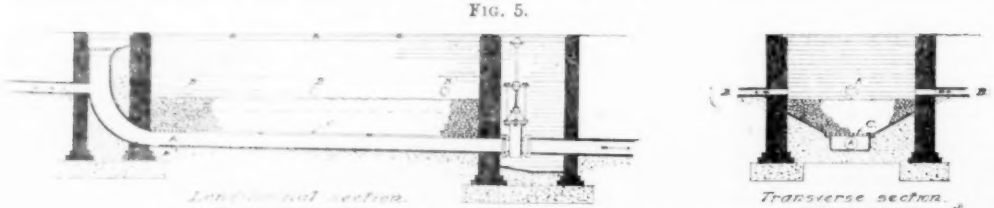
90. *Deductions.*—A knowledge of the conditions favourable to the development of bacterial life throws considerable light upon several points—viz., how polluted water that escapes from a drain or cesspool at a point below that where bacterial life exists will in certain soils that are incapable of mechanical filtration infect water at a considerable distance and depth, whilst the liquid from excremental matter placed upon the surface of the soil would be cleared of its impurities at the depth of a few inches. Such knowledge would assist in the intelligent and proper arrangement of subsoil drains and explain the necessity of the intermittent in place of the continuous discharge of the flow of sewage in all cases of irrigation.

SEWAGE FILTERS.

91. *London County Council Experiments.*—Many of our readers will be familiar with the experiments upon biological filtration of sewage carried out by Mr. W. J. Dibdin on behalf of the London County Council, extending over a period from 1892 to 1895. The results obtained were most remarkable. The quantities dealt with were of course enormous, but the means adopted were of the simplest, one of the most successful consisting of a hole being dug 3 ft. deep in a clay soil, breaking up and burning the clay removed and replacing the same before turning in the sewage. Of the various materials tried burnt ballast or coke breeze was found to be the most effective. The conclusions arrived at were that the action was twofold: (1) all suspended matter was mechanically separated and a clear bright effluent obtained; (2) oxidation of organic matter both in suspension and solution was effected through the agency of living organisms—also, provided that suitable conditions were observed for the preliminary establishment and subsequent cultivation of these organisms, there was practically no limit to the degree of purity capable of attainment; and provided certain periods of rest were allowed to the filters the same might be used for an indefinite time. A full report of the foregoing experiments was published by the London County Council in the County Council Papers, No. 246, price 2*d.*, sold by E. Stanford, Charing-cross.

92. Somewhat prior to these experiments Mr. W. D. Scott Moncrieff was engaged upon a similar course of investigations and in 1891 patented his "Cultivating Tank," longitudinal and transverse sections of which are shown in Fig. 5. This tank, or rather filter, was filled up to the level of the overflows (lettered B) with flints, upon the surfaces of which the organisms were propagated; an iron grating C supported these cultivating blocks and allowed the sewage entering at A to flow upwards—this channel being named a "restricting chamber." A penstock was provided at the extreme end of this chamber to admit of the occasional escape of any sludge or mineral matter which might from time to time accumulate. The filter is chiefly anaerobic in action, but the effluent is made to pass through a second chamber filled with coke, named by Mr. Scott Moncrieff a "nitrifying channel," in which the action is aerobic. It is evidence of the remarkable reluctance displayed by the community at large to adopt anything like a new departure that so few comparatively of these tanks have come into use. Its extreme simplicity probably militates against it. Speaking from observation of two installations to houses of moderate size nothing can be more simple and free from objections. In the larger house examined the work was carried out under Mr. Philip Webb, R.I.B.A. Two of these filters were fixed side by side and the stream of sewage diverted into each alternately every month, all grease being carefully excluded by means of a grease trap gully. In size each filter measured about 10 ft. long by 2 ft. 6 in. wide and 3 ft. deep. The effluent was clear and almost inodorous. It was passed immediately into a small pond about 30 ft. by 15 ft in which water newts and pond life generally seemed to be abundant.

FIG. 5.

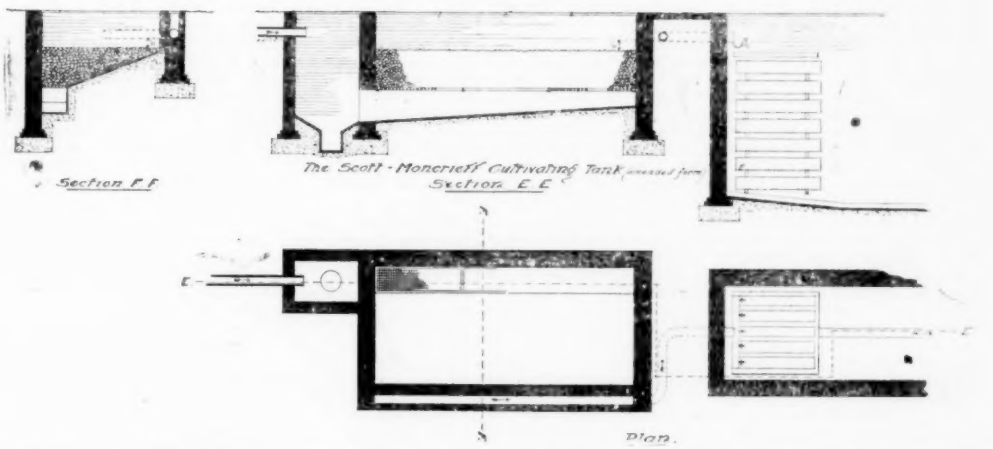


The Scott-Moncrieff Cultivating Tank. (original form)

By analysis Mr. Scott Moncrieff found that the fall in the quantity of albuminoid ammonia and free ammonia in the effluent was out of all proportion to the amount of dilution when the effluent was made to discharge into a stream of water of three times its own volume, the fall in the albuminoid ammonia being 7 to 1 and free ammonia about 20 to 1. This clearly proved that, beyond the actual liquefaction and purification which had resulted from the passage of the sewage through the tank, an element of instability had been imparted to the organic matter present, rendering it capable of being rapidly oxidised. This led to a further series of experiments, the result of which has been a slight modification in the form of the original filter and the substitution of filter-trays for the original "nitrifying channel." The inventor gives as his reasons for the multiplication of the filter-beds the following:—1. The process of purification by biolysis is a gradual one. 2. By dividing the process into stages each stage will represent a different character of food-supply. 3. No one kind of organism is capable of flourishing in all the different media or stages equally well. From this he assumes that each stage should occur regularly if each differentiated group of organisms is to work to the best advantage.

Hitherto there has been little difficulty in the removal of polluting organic matter in suspension which could readily be done by precipitation; the question to be solved was the reduction of the organic matter in solution. Bacteriology has revolutionised all this, and the first object aimed at is to convert the whole of the solid sewage into a condition of solution and by the same process into a state of instability, which renders it eminently susceptible of further change into inorganic elements. This soluble and unstable condition is obtained in the first filter, the first stage being the arresting of the free oxygen present in the sewage by the aid of aerobic organisms and the subsequent liquefaction of the solid organic matter by organisms of the anaerobic class with conversion into ammonia with other changes. Illustration Fig. 5A gives the latest form of this filter and also of the nitrifying chamber containing a number of sieves or trays supported one above the other upon a metal framework. Into the uppermost of these trays the effluent from the first tank is conducted through metal troughs which are balanced so as to tilt over when full and discharge their contents, afterwards automatically regaining their first position. The liquid thus discharged into the top tray percolates into those below, occupying a little less than seven minutes in its progress through the trays. Each tray is filled with coke to a depth of 6 in., the coke being first broken so as to pass through a ring of 1 in. diameter. It will be noticed that there is an air space between each of the trays, so that their condition is rendered thoroughly aerobic.

FIG. 5A.



93. Advocates for the ultimate disposal of sewage on biological lines may be taken as being divided at present into four camps represented by one of the following exponents:—1. Mr. W. D. Scott Moncrieff, the projector of a system of upward filtration under anaerobic conditions, supplemented by a farther downward filtration of the effluent through a series of aerobic filters (see preceding paragraph). 2. Mr. W. J. Dibdin who favours the downward method through filters not altogether dissimilar to the last, but depending almost entirely upon aerobic action. (See par. 91.) 3. Mr. Cameron who dispenses with the filter in the first instance and relies upon a fermentative process, liquefaction being brought about in a large vat, by a floating population of anaerobic microbes, the effluent afterwards passing through a nitrifying or aerobic filter. (See par. 96.) 4. Dr. G. V. Poore, the last in order but probably the first to recognise the agency of bacterial life as applied to this purpose, may be called the apostle of the dry method. When dealing, however, with slop-water he is at one with Mr. Dibdin. (See his filtration gutter illustrated, Figs. 28, 29, and 30.)

94. The surprising results obtained by these several processes are quickly bringing fresh workers into the same field of research. Amongst others Dr. H. R. Kenwood, Assistant Professor of Public Health in University College, London, and Dr. William Butler conducted a series of experiments upon the practical working of an installation of biological filters at the Finchley Sewage Farm; also with a working model of the same works fitted up at University College, London. During a period of six months from February to July, 1898, no less than 363 analyses were made and the results of these experiments and analyses are embodied in a paper read at the meeting of the Sanitary Institute which paper is probably the most lucid and concise account of the biological treatment of sewage yet published. After due consideration of the several existing methods for the liquefaction of sewage through bacterial agency they constructed three filters as follows. The first, under anaerobic conditions, measured 24 ft. square and was similar in principle to the original Scott Moncrieff tank (see par. 92) only on a larger scale and the action was upwards. The second and third were aerobic in action and the filtration was downwards. The bottoms of these filters were laid with agricultural drain-pipes fitted with valves at the outlets. These pipes were covered with 12 in. of coarse clinkers, supporting 8 in. of anthracite coal dust, on which rested 18 in. of coarse coke. Rows of drain-pipes 2 ft. apart placed vertically penetrated 3 in. below the surface of the coal dust to ensure aerobic conditions in the body of the filter. No. 1 filter remained charged during the whole course of the experiments, but the period during which the sewage was allowed to rest in it was varied from one to twenty-four hours. In this filter the action was upwards. The other filters, in which the action was downwards, were treated intermittently, the overflow from the preceding filter or filters being gently distributed over the surface, four hours' rest being given when full, after which each was allowed two hours in which to slowly empty. By this arrangement each of these filters was charged and emptied twice each day and remained empty during the night.

The following are a few of the principal facts noticed in the report:—Liquefaction of the sludge being naturally a

much slower process than the purification of the already liquid portion of the sewage a longer period of rest had to be allowed for this purpose in the first filter, in the construction of which preference was given to one of an anaerobic character having an upward action. An objection to downward filtration was that in time the sludge caked on the top of the filter and required to be raked over. The longer the sewage remained in this filter the greater was the reduction in the opacity of the effluent, but the most rapid filtration attempted did not permit any but the very finest particles of suspended matter to pass through. Upon the completion of the experiments very little suspended matter was found in the filter and of this about 43 per cent. only consisted of volatile solids, the rest being grit, hair, and fibres.

In sewage passed straight through this filter the oxygen absorbed by the effluent from permanganate, according to Tidy's method, was reduced about 30 per cent. After the sewage had rested in the filter for one hour the reduction exceeded 40 per cent. An increase, however, occurred in the oxidisable organic matter during the first twenty-four hours on the one hour figure, and afterwards diminished to a mean of about 20 per cent. on that of the one hour. This would indicate a reduction of unstable putrescible matter to an ultimate degree of stability more quickly than that of the more stable organic compounds to the intermediate unstable condition. Afterwards up to twenty-four hours when the amount of the unstable compounds was exhausted reduction to the ultimate stable condition only took place, with an increasing diminution of the oxidisable organic matter. The behaviour of the ammonias quite coincided with the action of the filter on the oxidisable organic matter. One curious effect was noticed—namely, that this filter under certain conditions had the power to abstract and store within itself the ammonia from the sewage. The action of this anaerobic filter was first a straining off of the suspended matter and liquefaction of the same with a partial amount of purification.

The secondary or nitrifying filters.—Of these it was said that changes which could only be expressed in terms of stability and resistance occurred repeatedly which are not indicated by analysis. As a result the importance of a number of these aerobic filters is clearly indicated. For instance, the albuminoid ammonia figure of the effluent of No. 2 filter on a certain day was 0·40. This filter had been charged with an effluent already subjected to twenty-four hours' rest in No. 1, but upon passing into and resting for an hour in No. 3 it was reduced to 0·16, or 60 per cent. Thus neither the long rest in No. 1 nor the hours' rest in No. 2 had satisfactorily reduced the albuminoid ammonia, but the combined action of these two filters had so shaken the stability of the organic matter, as shown by the albuminoid ammonia, that in its passage through No. 3 filter it was reduced 60 per cent. Another argument advanced in favour of a multiplication of these filters is that the effluent first drawn off is relatively much worse than that passing subsequently, also that a filter may suddenly and unaccountably become over-taxed. A filter in its highest stage of biological efficiency will only effect a given percentage reduction on the pollution of its affluent. Supposing the pollution to be high and the filter capable of effecting a purification of 50 per cent. its effluent will still remain a filthy liquid, to be again reduced another 50 per cent. in its passage through another filter. Thus the process is continued till the desired stage of purity is arrived at. As a means of discovering the period of rest required by an over-taxed aerobic or nitrifying filter a daily estimate of the amount of ammonia eliminated per square foot of the surface of the filter was made, it being found that when this process was most active the filter was over-taxed and nitrification was practically at a standstill; and when with rest this elimination of ammonia ceased the filter was again found ready for work. Finally, the reduction of the unstable to the stable or ultimate was best effected by change of filters; that of the stable to the unstable by rest in a filter. High albuminoid ammonia, as already stated, indicated rest; high oxygen absorbed was an index for passing the effluent on to another aerobic filter.

95. *Vidangeuse Automatique.*—Upon biological lines but less exhaustively treated is M. Louis Mouras' "vidangeuse automatique," consisting of an air-tight box through which the sewage is passed and in which the anaerobic microbes are developed.

96. *Septic Tank at Exeter.*—The city of Exeter in 1896 adopted this principle with certain alterations and additions, for which Mr. Donald Cameron, the city surveyor, obtained a patent. A very full report of this tank and apparatus appeared in THE LANCET of Dec. 5th, 1896. Briefly it is as follows:—

About 90,000 gallons of sewage are dealt with daily and the installation is situated near to the town on the banks of the River Exe. With the exception of the septic tank, which is covered by a grass mound, the whole of the works may be said to be below the ordinary level of the ground.

The septic tank is 64 ft. by 18 ft., with a depth of from 7 ft. to 10 ft. and a capacity of from 61,000 to 72,000 gallons. Immediately outside the entrance to this tank is a small chamber, access to which is obtained by means of a manhole. This chamber, divided longitudinally into two compartments, is also provided with a cross weir adjacent to the tank, and into one or other of these compartments the raw sewage is turned, which allows of the one at rest being cleared of any deposit which may have accumulated. In each of these is a coarse screen, intended only to arrest any foreign object which might have gained access to the sewer. The inlets to this chamber, placed close to the bottom, being larger than the outlets into the septic tank, the sewage enters the chamber under a certain amount of pressure, thereby agitating any sediment, such as road drift, and enabling it to separate from the organic matter present; from here it flows gently over the submerged weir which divides this chamber from the septic tank. The tank itself is deprived as much as possible of light and air, and in it the sewage remains for some little time almost stationary, eventually escaping from the outlet which is situated about the middle depth. Under these conditions the anaerobic microbes multiply with such astonishing rapidity as soon to dominate the situation and unless for the entrance of fresh matter would be themselves destroyed by their own products.

By descending a manhole placed in the centre of the tank and fitted with a window may be seen a layer of floating scum containing the lighter solids, and at the bottom a thin layer of heavier sediment.

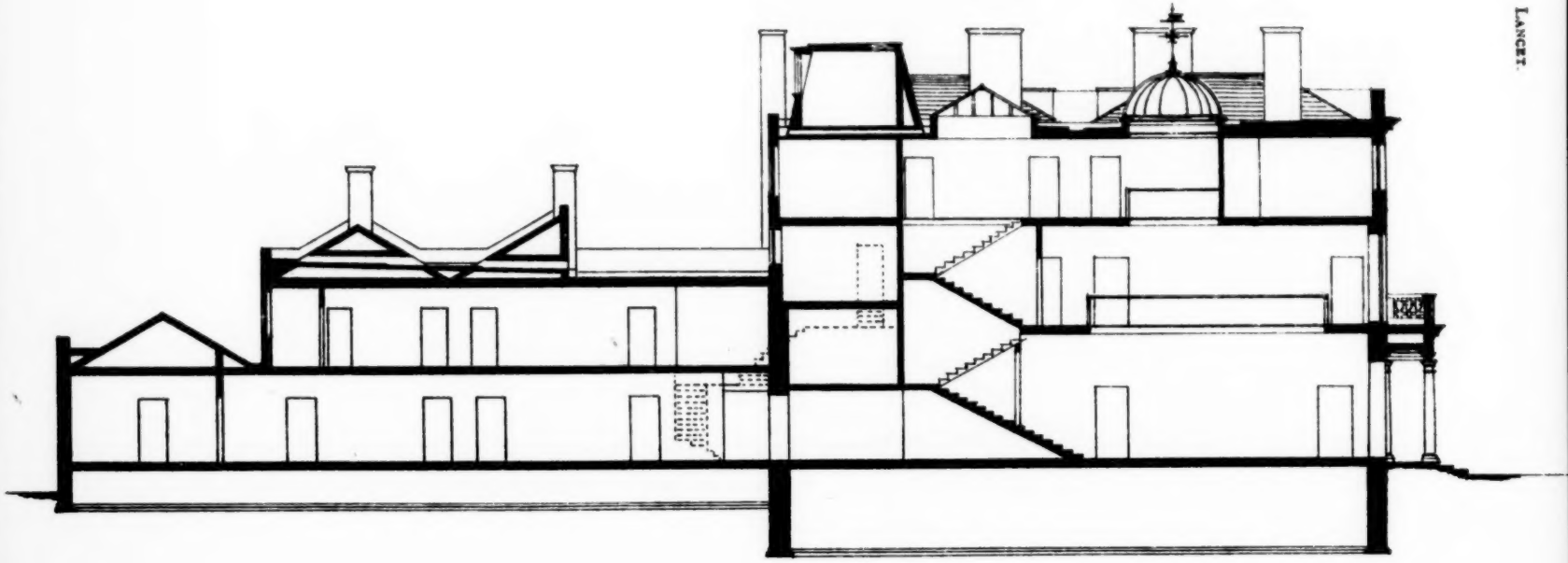
The greater part of the organic matter of the floating substance being dissolved the residue is drawn to the bottom by the ash, but here it is evidently seized upon by the microbes and a bubble of gas is formed which buoys it to the top again; here the gas escapes and it again falls; this process continues so long as any organic matter remains. The whole tank is alive with these particles and gas ascending and descending. The escaping gas being ignited the residue consists of inorganic ash upon which the microbes cannot feed; it was found that 2,000,000 gallons of sewage passing through a tank 24 ft. by 9 ft. only produced 4 in. of this sediment; a perfectly liquid effluent of a brownish-yellow tint most suitable for purposes of irrigation is the result. It is said that the action of the microbes is not interfered with by the presence of a certain amount of chemical waste from factories. At all events this is the case at Yeovil where it has been tried. Upon leaving the septic tank the liquid sewage has a slight odour, but after aeration in overflowing the sides of a V-shaped trough through which it passes on its way to the filters this odour is lost.

In the filters, of which there are five, two in alternate use and one at rest, the nitrifying organisms of the aerobic class are busy at the work of oxidation; this process is arrived at by the ammonia present being converted into nitric acid which combines with the bases present to form nitrates.

Coke, breeze, and clinkers to a depth of five feet are used in the filters and as each is charged an ingenious invention, forming part of Mr. Cameron's patent, diverts the flow automatically into the next filter and at the same time opens a valve which discharges the contents of the one just filled.

It has been found important that each filter should have a rest of one week in four. From these filters it is possible to obtain a perfectly clear filtrate containing a fifth of organic nitrogen per 100,000 parts, which is less than the amount suggested as being admissible by the Rivers Pollution Committee. Some fixed standard is desirable as to the amount of pollution that should be admitted into streams, these points being as a rule left for the decision of the chemist for the time acting on behalf of the several conservators.

97. *Dr. Poore's System.*—A description of Dr. G. V. Poore's system will be found illustrated in the treatment of the bailiff's house and lodge in the following example. The preference has been given to the water-carriage system when dealing with the mansion and other buildings, but



No 4 Section a.-b.
existing.

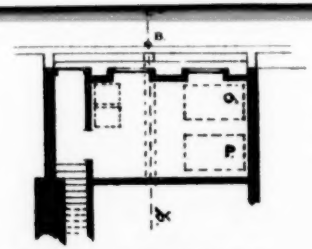
Scale of 10. 5. 0. 10. 20. 30. 40. 50. 60 Feet.

ROOF PLAN NO. 1 AMENDED.

A Rain-water pipe, Par. 108.
B " " Par. 110.
C " " Par. 110.
D " " Par. 112.
E " " Par. 114.
F " " Par. 114.
FF Soil-pipe to w.c. T, Par. 147.
GG " " S and V, Par. 148.
HH " " U, Par. 151.
TT Bath and sink wastes, Par. 159 and 169.
UU " " Par. 157 and 167.

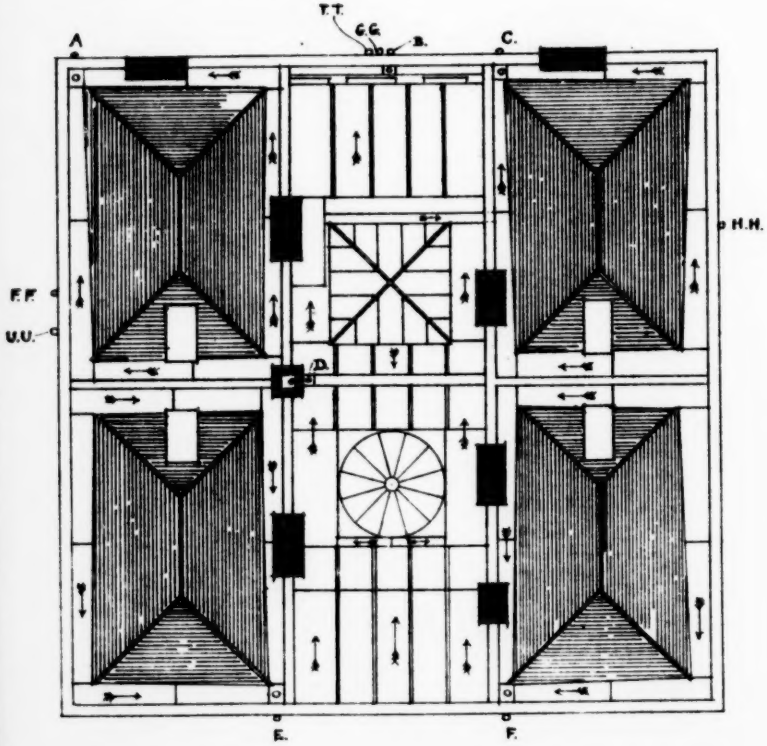
ROOF PLAN NO. 2, EXISTING.

A Rain-water pipe, Par. 107.
B " " Par. 109.
C Non-existent.
D Rain-water pipe; also soil-pipe from w.c. T, &c., Par. 111.
E Rain-water pipe, Par. 113.
F " " Par. 113.

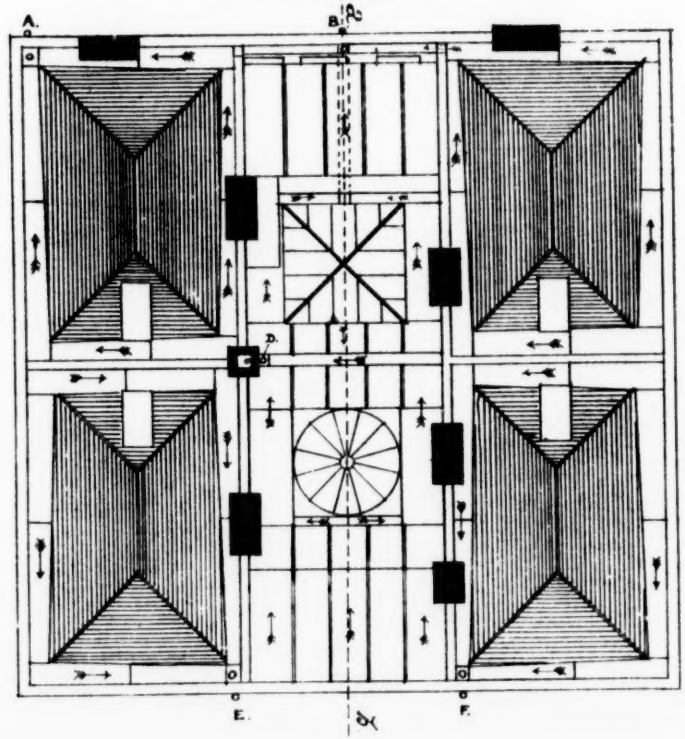


O Cistern supplying drinking-water to sinks, &c., Par. 124.
P Cistern supplying w.c.'s, Par. 125.

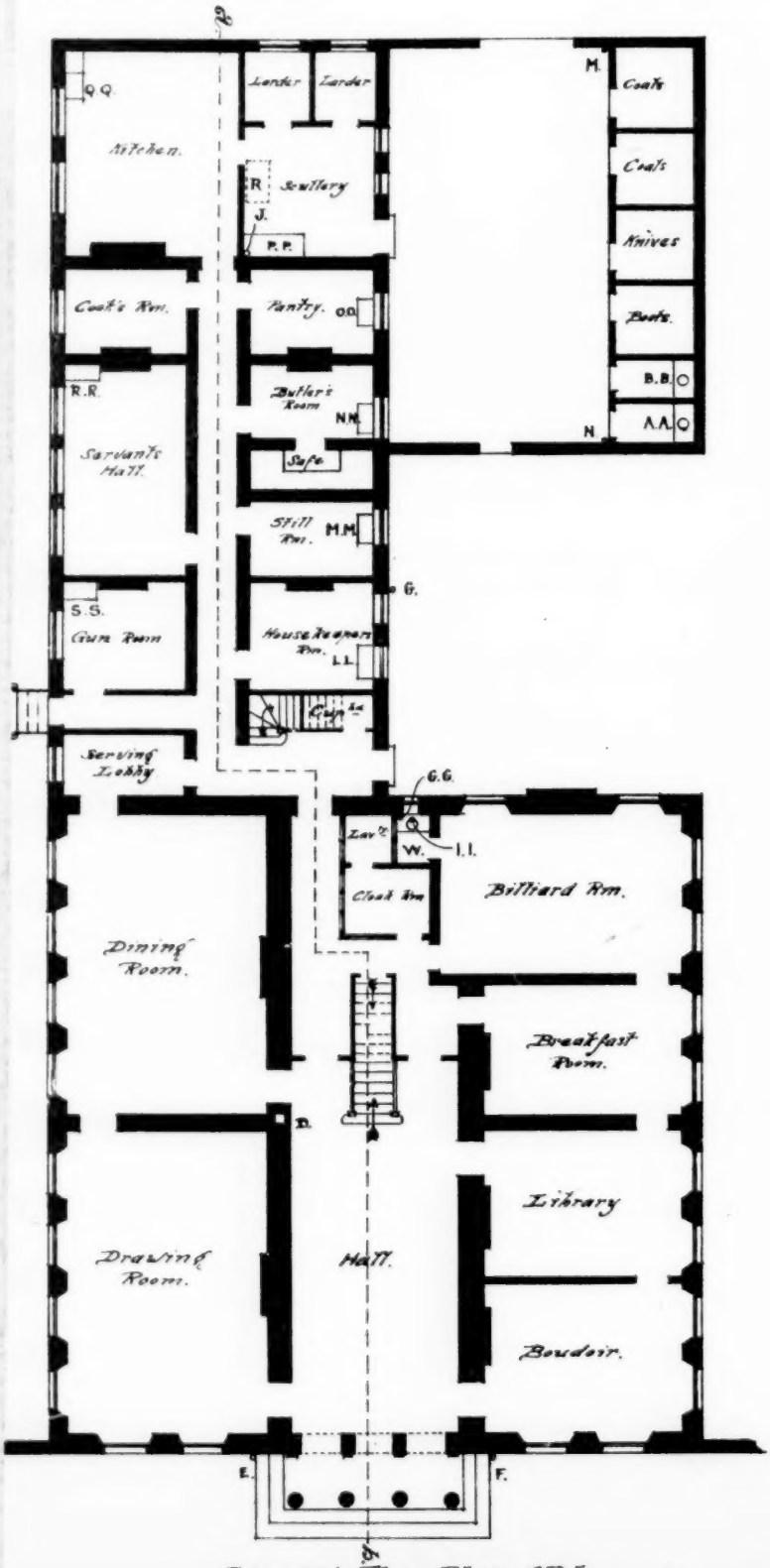
No 3. Plan of Cistern Room.



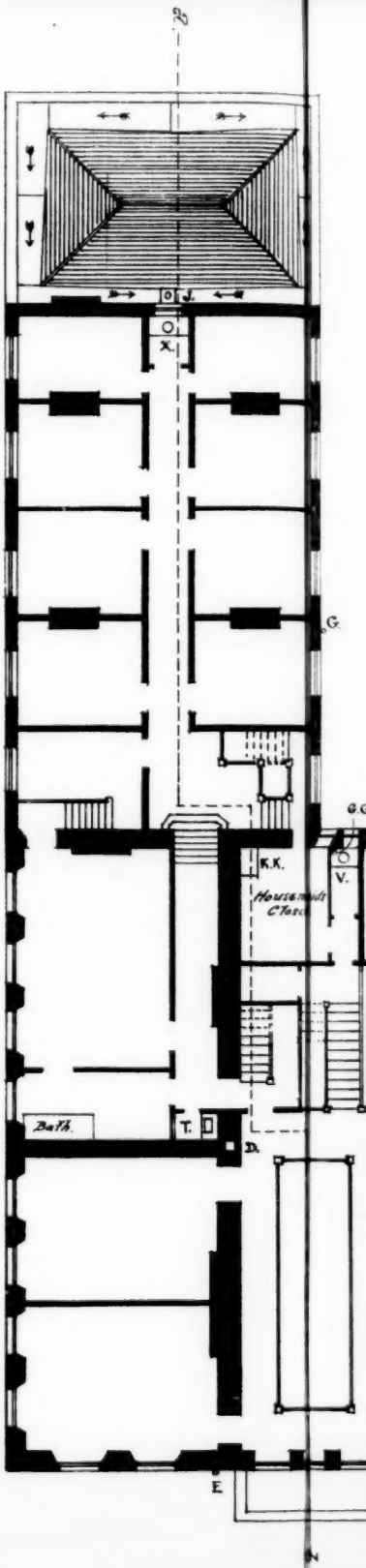
Roof Plan. No 1. amended.



Roof Plan, No 2. existing.



Ground Floor Plan, No. 5.
existing



First Floor
existing

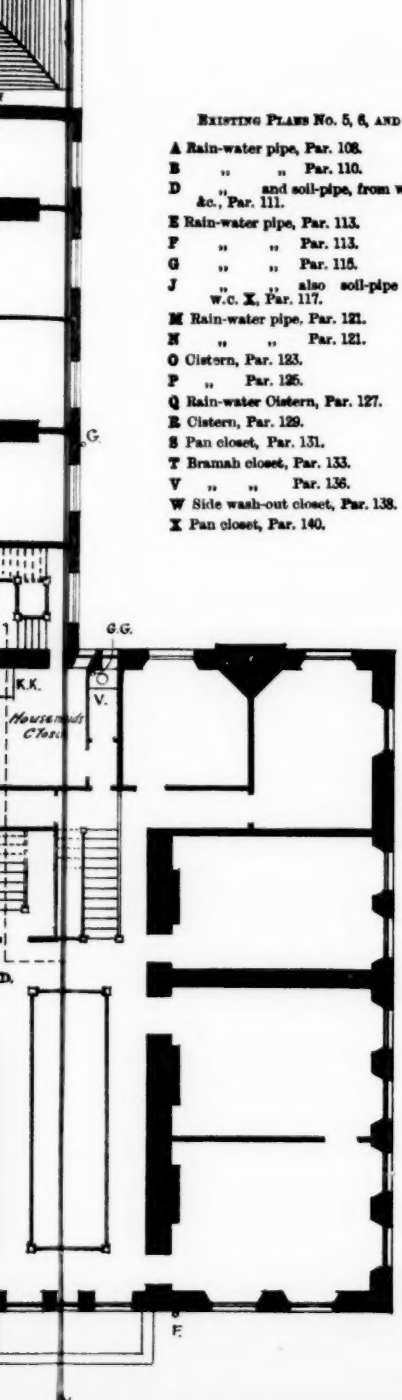
Scale of 10. 5. 0. 10. 20. 30. 40. 50. 70. 70. 70. 70. Feet

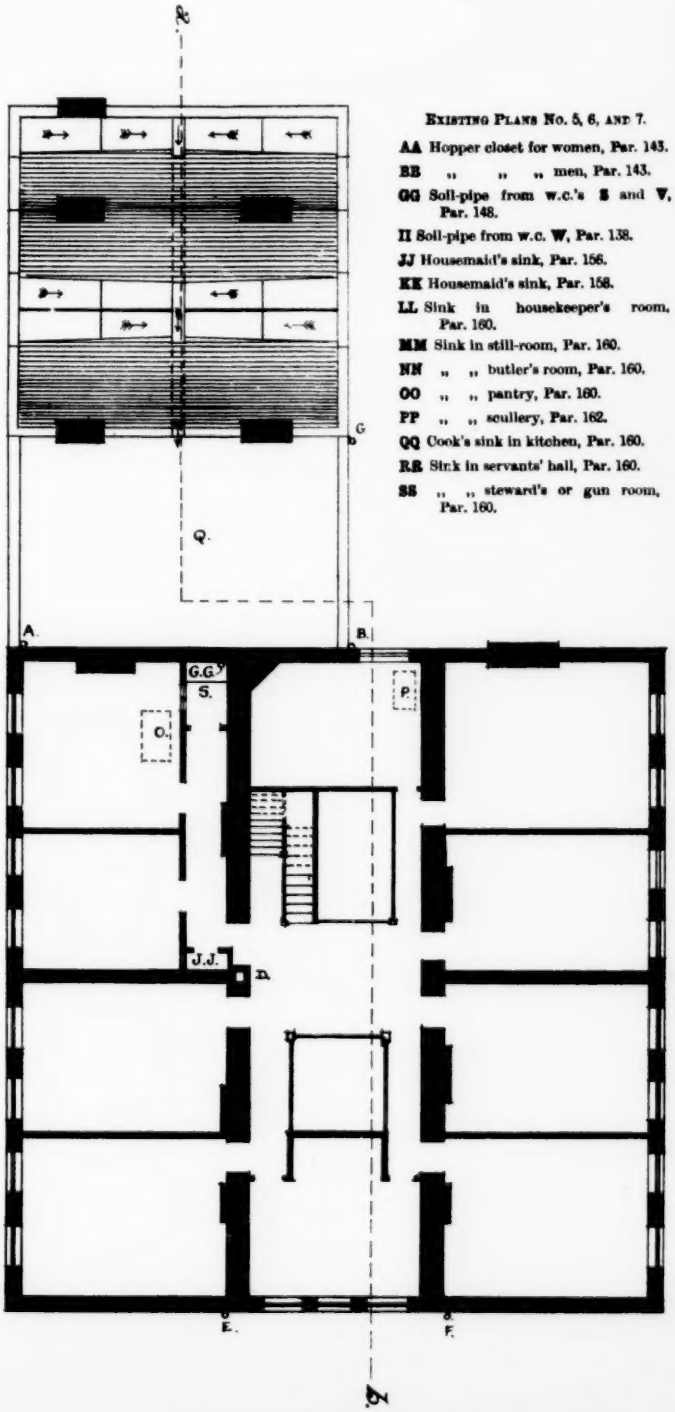
EXISTING PLANS No. 5, 6, AND 7.

A Rain-water pipe, Par. 108.
B ,, ,, Par. 110.
D ,, and soil-pipe, from W.C. **T**, &c., Par. 111.
E Rain-water pipe, Par. 113.
F ,, ,, Par. 113.
G ,, ,, Par. 115.
J ,, ,, also soil-pipe from W.C. **X**, Par. 117.
M Rain-water pipe, Par. 121.
N ,, ,, Par. 121.
O Cistern, Par. 123.
P ,, Par. 125.
Q Rain-water Cistern, Par. 127.
R Cistern, Par. 129.
S Pan closet, Par. 131.
T Bramah closet, Par. 133.
V ,, ,, Par. 136.
W Side wash-out closet, Par. 138.
X Pan closet, Par. 140.

EXISTING PLANS No. 5, 6, AND 7.

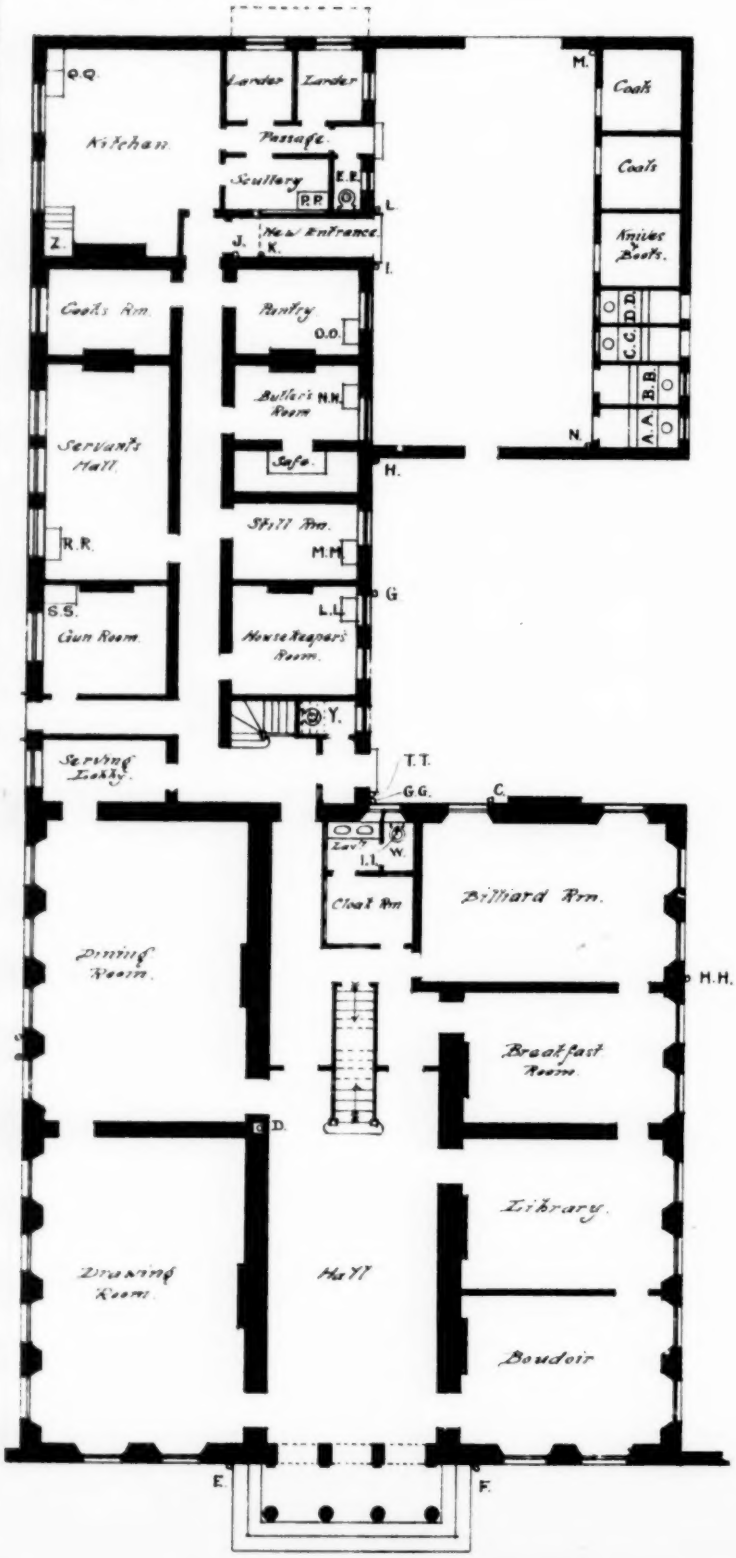
AA Hopper closet for women, Par. 143.
BB ,, ,, ,, men, Par. 143.
GG Soil-pipe from W.C.'s **S** and **V**, Par. 148.
II Soil-pipe from W.C. **W**, Par. 138.
JJ Housemaid's sink, Par. 156.
KK Housemaid's sink, Par. 158.
LL Sink in housekeeper's room, Par. 160.
MM Sink in still-room, Par. 160.
NN ,, ,, butler's room, Par. 160.
OO ,, ,, pantry, Par. 160.
PP ,, ,, scullery, Par. 162.
QQ Cook's sink in kitchen, Par. 160.
RR Sink in servants' hall, Par. 160.
SS ,, ,, steward's or gun room, Par. 160.



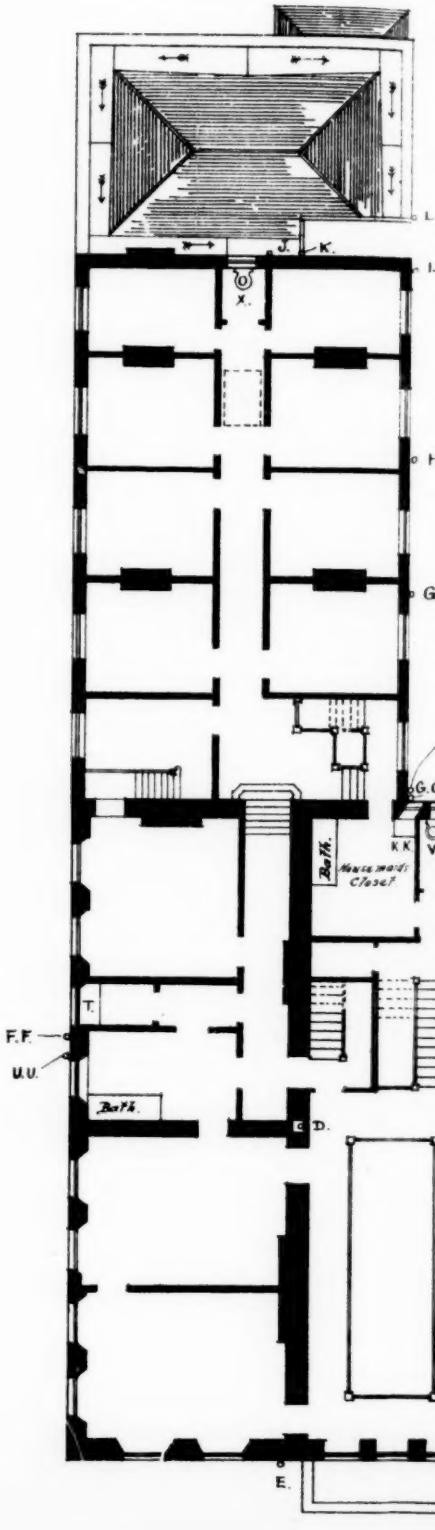


rst Floor Plan, No 6.
existing.

Second Floor Plan, No 7.
existing.



Ground Floor Plan, No 8. amended.

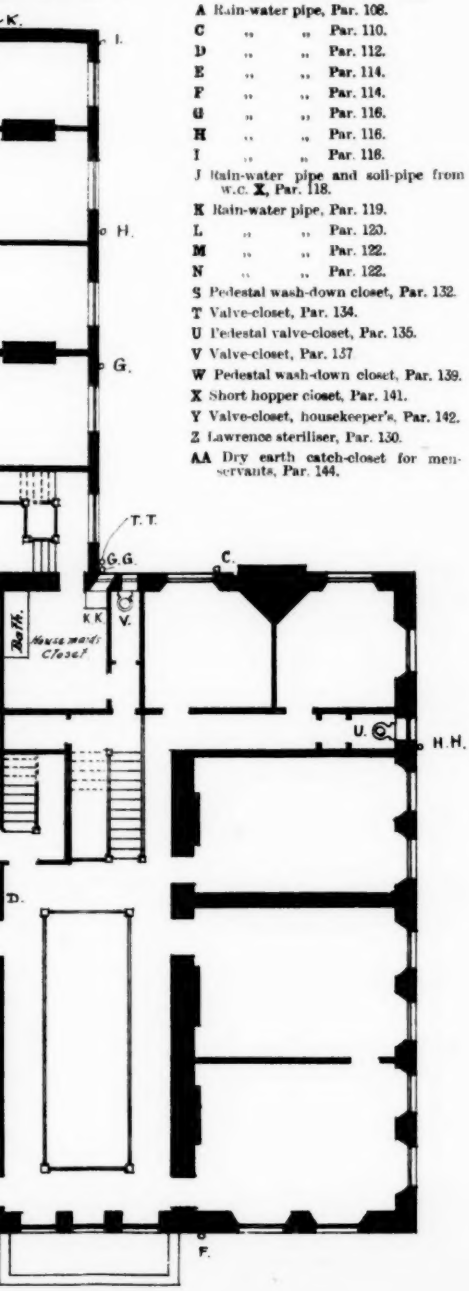


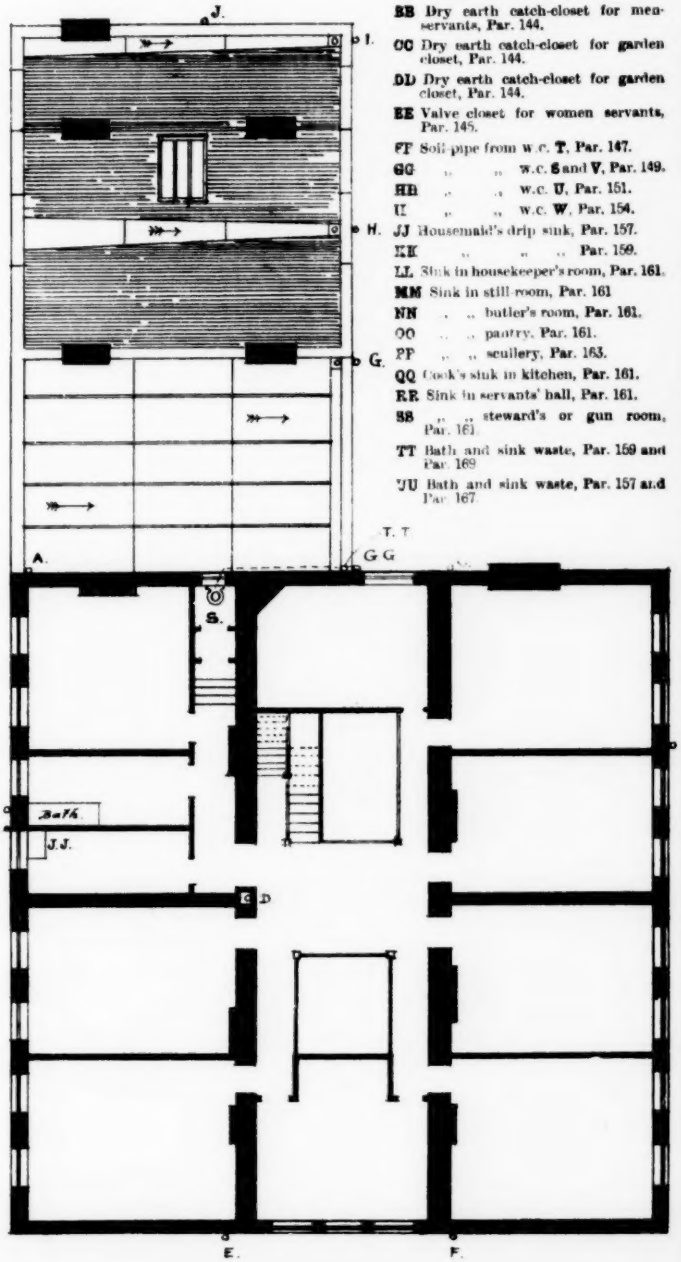
First Floo amende

Scale of 10 5 0 10 20 30 40 50 60 Feet

AMENDED PLANS 8, 9, AND 10.

A Rain-water pipe, Par. 108.
C ,, ,, Par. 110.
D ,, ,, Par. 112.
E ,, ,, Par. 114.
F ,, ,, Par. 114.
G ,, ,, Par. 116.
H ,, ,, Par. 116.
I ,, ,, Par. 116.
J Rain-water pipe and soil-pipe from w.c. **X**, Par. 118.
K Rain-water pipe, Par. 119.
L ,, ,, Par. 120.
M ,, ,, Par. 122.
N ,, ,, Par. 122.
S Pedestal wash-down closet, Par. 132.
T Valve-closet, Par. 134.
U Pedestal valve-closet, Par. 135.
V Valve-closet, Par. 137
W Pedestal wash-down closet, Par. 139.
X Short hopper closet, Par. 141.
Y Valve-closet, housekeeper's, Par. 142.
Z Lawrence steriliser, Par. 130.
AA Dry earth catch-closet for men-servants, Par. 144.



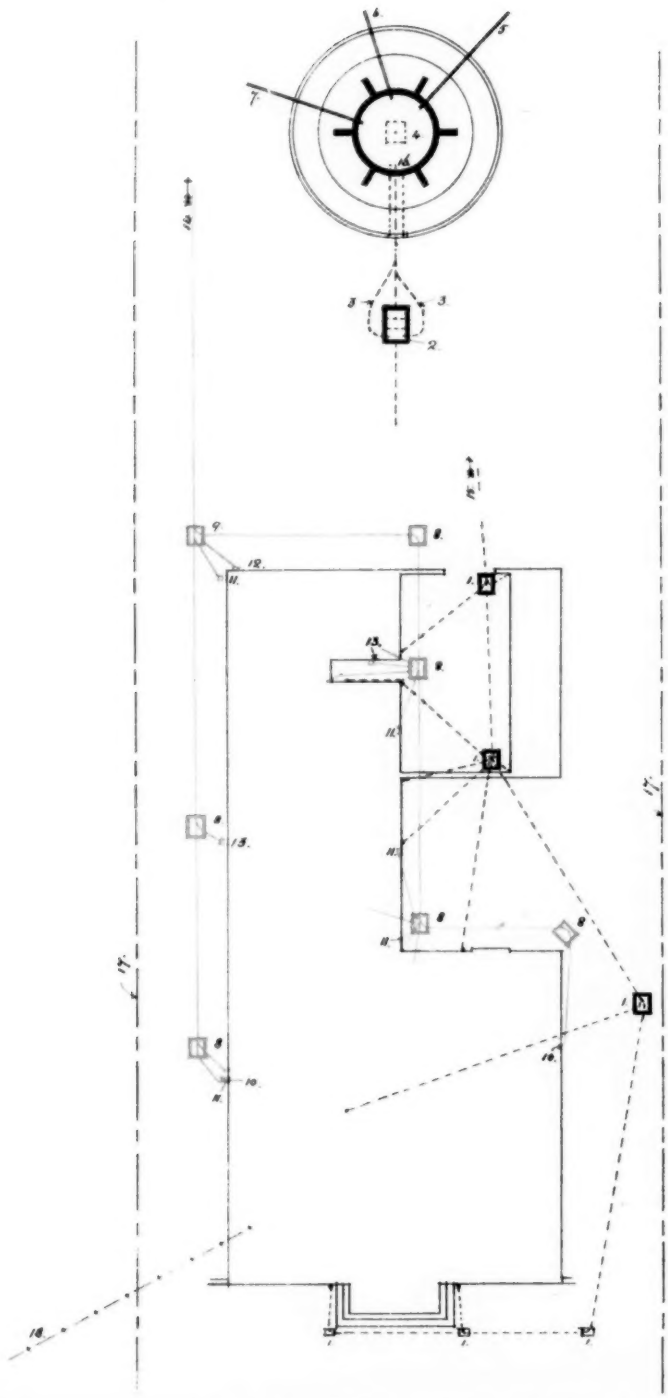


AMENDED PLANS 8, 9, AND 10.

BB Dry earth catch-closet for men-servants, Par. 144.
CC Dry earth catch-closet for garden closet, Par. 144.
DD Dry earth catch-closet for garden closet, Par. 144.
EE Valve closet for women servants, Par. 145.
FF Soil-pipe from w.c. **T**, Par. 147.
GG ,, ,, w.c. **S** and **V**, Par. 149.
HH ,, ,, w.c. **U**, Par. 151.
II ,, ,, w.c. **W**, Par. 154.
JJ Housemaid's drip sink, Par. 157.
KK ,, ,, ,, Par. 159.
LL Sink in housekeeper's room, Par. 161.
MM Sink in still-room, Par. 161
NN ,, ,, butler's room, Par. 161.
OO ,, ,, pantry, Par. 161.
PP ,, ,, scullery, Par. 163.
QQ Cook's sink in kitchen, Par. 161.
RR Sink in servants' hall, Par. 161.
SS ,, ,, steward's or gun room, Par. 161.
TT Bath and sink waste, Par. 159 and Par. 169
UU Bath and sink waste, Par. 157 and Par. 167

irst Floor Plan No 9
amended.

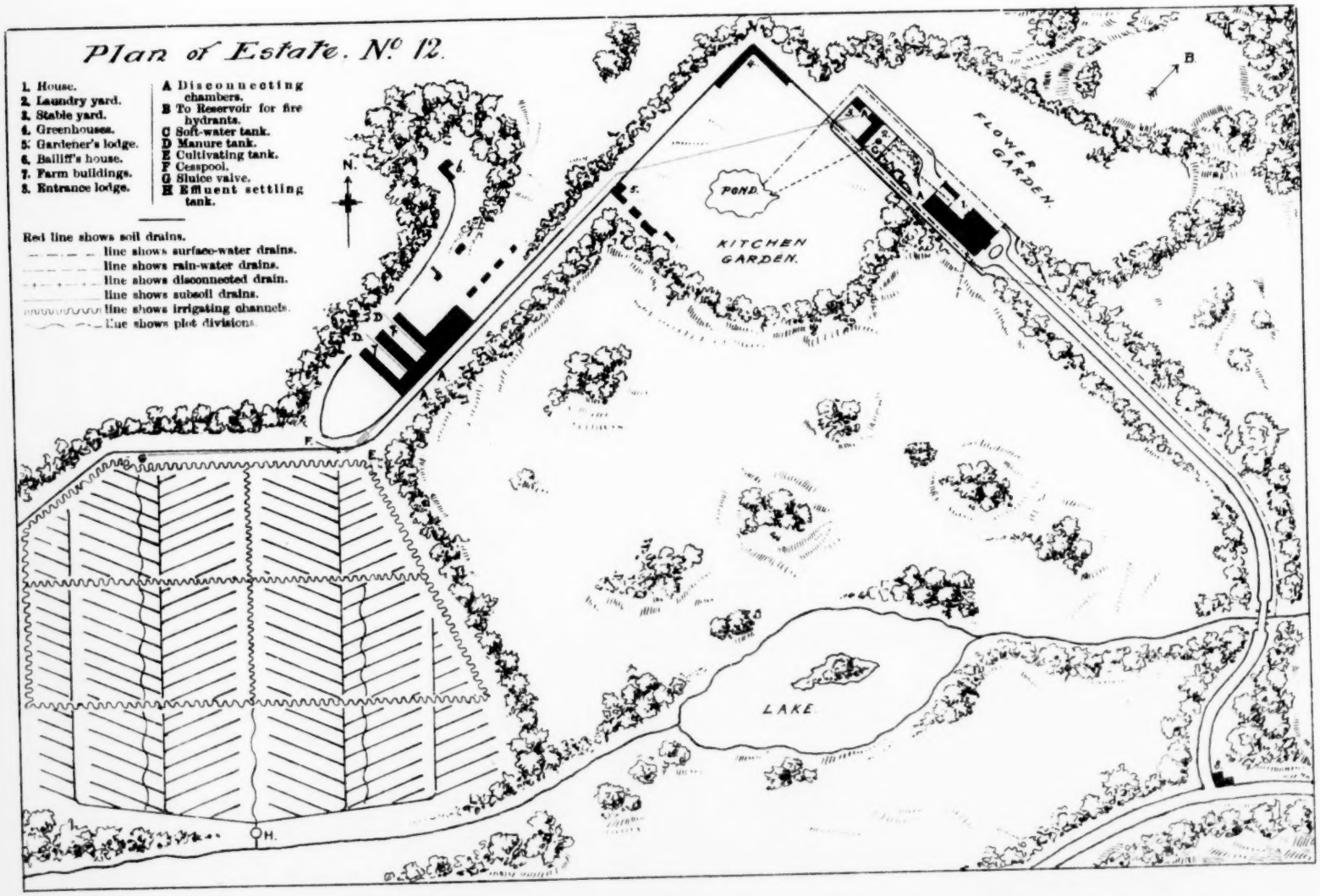
Second Floor Plan, No 10.
amended



1. Inspection chambers and cleansing eyes on rain-water drain.
2. Filter on rain-water drain, Par. 21.
3. Overflows to filter, Par. 181.
4. Rain-water tank, Par. 182.
5. Inlet taking rain-water from laundry buildings.
6. Inlet taking rain-water from stable buildings.
7. Overflow from rain-water drain carried to pond.
8. Inspection chambers on soil drains.
9. Intercepting chamber, Par. 195.
10. Position of discharge from flushing tanks fixed in cistern room, Par. 196, Note *P*.
11. Trapped gullies taking wastes from sinks, baths, and lavatory.
12. Fresh-air inlet.
13. Grease gulley.
14. To sewage tank.
15. To rain-water tank.
16. Inlet to rain-water tank.
17. Position of main surface water drains, Pars. 180, 1
18. Disconnected drain from cellars, Pars. 189, 194.

Block Plan showing drains
No. II.

Scale of 10 0 10 20 30 40 50 60 70 80 90 100 Feet


Plan of Estate. No 12.
1. House.
2. Laundry yard.
3. Stable yard.
4. Greenhouses.
5. Gardener's lodge.
6. Bailiff's house.
7. Farm buildings.
8. Entrance lodge.
A Disconnecting chambers.
B To Reservoir for fire hydrants.
C Soft-water tank.
D Manure tank.
E Cultivating tank.
F Cesspool.
G Sluice valve.
H Effluent settling tank.
Red line shows soil drains.
line shows surface-water drains.
line shows rain-water drains.
line shows disconnected drain.
line shows subsoil drains.
line shows irrigating channels.
Blue shows plot divisions.
N.
POND.
KITCHEN GARDEN.
FLOWER GARDEN.
LAKE
B
A
C
D
E
F
G
H

the dry system is equally applicable, less expensive, and has under certain conditions an element of safety difficult of attainment in any system of water-carriage. With the dry catch very little attention is necessary, and the filtration gutter (par. 211) for any house of ordinary size can be used with perfect safety and moreover requires no attention. To quote from Dr. Poore's book, "Rural Hygiene," water fouled by domestic use should be thrown on the nearest available piece of ground; some will be thus evaporated, some will be absorbed together with much organic matter by the roots of growing plants, and the rest will filter slowly through the earth and find its way to a watercourse in a state of practical purity. In sewers and cesspools there is neither heat nor cold in summer or winter. In their muggy, damp atmosphere evaporation and oxygenation are impossible. And waste water, after travelling miles of pipes, is not appreciably diminished in volume and is charged in addition with whatever impurity it may have met with in its dark journey.

By the kind permission of Dr. Poore a girls' school and several cottages at Andover have been recently inspected where this system has been in use since 1891 and is acting most admirably, the actual results derived from the direct application of the sewage to the soil being very remarkable.

98. *Practical Details.*—Dr. Poore, who has devoted great attention to the deodorising system of sewage disposal, with highly gratifying results, says that the most favourable conditions for the growth of these bacteria are the presence in the earth of 33 per cent. of moisture, with a temperature of 50° C., also that the activity of these organisms is governed by many other conditions and that decomposition is controlled by the predominating factor for the time being. It will therefore be seen that the most suitable earth to use in an earth closet is the top layer from cultivated ground, which is more readily permeable to air and water; taken from a south slope would be best, but of course the nearest approximation to these conditions must be accepted, on no account, however, must the earth be dried by a stove. This should be done in an open shed. The power of the earth to humify excreta is increased by repeated use, as might be expected from what has been stated, owing to the increase of bacterial life, for this reason any large quantity is not absolutely necessary. Provided it be stored as stated in an open shed thoroughly exposed to the air and occasionally turned over, it will, according to Dr. Poore, be ready for re-use in some time varying from three weeks to three months, this being governed by the nature of the weather prevailing.

99. One of the great evils of the ordinary cesspool system is that all the gases generated by the fermenting mass of soil are confined and have no means of escape, or if any provision for ventilation is made it is mostly inadequate. A small grate as a fresh-air inlet, with perhaps a 4-in. outlet pipe, would do no more than relieve any pressure of gases that existed, but the air thus admitted could not oxidise the contents. Where no provision is made for ventilation the drain up to the house is in bad condition and the sewage gas is absorbed into the water in the traps, which if not frequently recharged will when saturated freely give it off into the air around.

100. In a cesspool with a covered top there are no conditions existing favourable to the oxygenation of its contents or to the development of those forces conducive to aught but putrefaction. The late Dr. Murchison held the opinion that these putrefactive changes in dejecta were themselves a cause of typhoid fever apart from the admixture of any specific poison, but this view would not now receive general support. The difficulty of rendering these cesspools permanently water-tight under the pressure to which they are subjected and the occasional escape of the liquid contents below the surface of the soil, which alone is capable of converting its impurities into purely inorganic compounds, should caution all against their use.

THE DRY SYSTEM.

101. *The Practice of Antiquity.*—In many things we are no wiser than our fathers. To go back to Moses, with what success did he conduct that vast horde of emancipated slaves for forty years under most unfavourable circumstances, and this by a strict adherence to hygienic laws?

102. *Moule's System.*—The Rev. Mr. Moule's dry-earth system, if properly attended to, is an efficient and inexpensive method; but, as already mentioned, everything depends upon this, for if the closets are neglected the system is about as objectionable a one as can be used. Mr. Moule advises that one or two loads of earth, as may be necessary, should be placed in a dry open shed, divided in the centre, and when dry placed in boxes attached to the closets. By lifting a handle a charge of earth is thrown into the pail each time the closet is used. A box at the side of the closet for earth and a metal scoop is to be preferred to this mechanical arrangement, as the operator is able to throw the earth well over the dejecta. Day by day the pails are emptied into the shed on the opposite side of the division to that which contains the dry earth. By the time the whole of the two loads of earth have been passed through the closets and are piled again in the shed the whole will be sufficiently dry for re-use. The process may be repeated many times, each time improving the manurial value of the earth. Where water is scarce and proper attention is given, this system is undoubtedly of value. If doors large enough to pass a pail through are fixed in the external walls to give admission to the space under the seats of the closets, the pails can be changed from the outside at stated and convenient times. Provision must be made for the disposal of the waste water from sinks, bath, &c., but it is less difficult to dispose of this entirely liquid matter and the quantity will be somewhat smaller than if water-closets are used. A modified system of irrigation is the only safe and proper way of dealing with the household slop water.

103. In a series of very full and able articles upon "Drainage and Sewage Disposal" that appeared in the latter part of 1896 in a paper devoted to architectural construction, the *Builder*, it is particularly gratifying to find hearty support given to more rational methods than have formerly prevailed. It refers to the altered conditions caused by the increased population having originally led to so-called sanitary reforms and the adoption of the prevailing sewerage systems, which systems would seem more or less an endeavour to relieve nature of the responsibility of dealing with the question. Finding that these methods were no efficient substitute for nature's laws sanitarians are now upon a surer road to success by becoming her humble students. Speaking of the dry system the *Builder* adds: "It has been pointed out that the suspended organic matter in water-carried sewage consists principally of fæcal matter and constitutes the chief difficulty in disposal. The solid excreta may be taken on an average as amounting to four ounces per head per day. Assuming the total amount of the sewage at twenty gallons per head per day the solid excreta only forms $\frac{1}{800}$th part. The main object of the chemical treatment of water-carried sewage is to extract this solid excreta in order that the remainder or liquid portion of the sewage may be properly treated. The excreta, which before dilution possessed considerable manurial value, after separation by precipitation becomes of very little value. The system of water carriage and subsequent chemical treatment from this point of view is analogous to intentionally losing a needle in a haystack and then with much labour recovering it—rusty. Where possible prevention is undeniably better than cure, and if the solid fæcal matter can be excluded from the sewage in the first instance without causing a greater difficulty in another direction such a system must be the best."

104. The nitrifying power of the soil depends, as has been seen, upon the presence of bacteria, and these are dependent again upon the amount of air present. It is possible by thoroughly draining a porous soil to greatly extend the area of microbial life downwards. In intermittent irrigation air is drawn down by the water as it soaks into the ground. With sewage in a liquid form uncharged with chemicals likely to delay nitrification a well-cultivated plot of land of limited area would be quite equal to the requirements of even a large establishment.

THE COUNTRY HOUSE.

105. That the example given in the Report of the insanitary condition of the country house, though an imaginary one, is a fair specimen of many such houses which are to be found throughout the country, the following details extracted from a paper read by Mr. Maurice B. Adams, R.I.B.A., at a general meeting of the Royal Institute of British Architects on Jan. 8th, 1894, will show. The paper relates to the Drainage and Water-Supply of Blickling Hall, Norfolk, which was erected in the year 1620 upon the site of a former building. The house,

like many of its class which were constructed about that time, stands in a hollow. The whole of the ground surrounding the house was water-logged and it would appear from the analysis of the water which was procured at the well-sinking operations that this water might be described as diluted sewage. The house was surrounded by a moat, beneath which ran an old and defective brick culvert which received all the drainage. This culvert after delivery into a cesspool passed under one end of the bed of a lake about 500 ft. from the house and was finally lost in a copse three-quarters of a mile away; here the overflow sewage mingled with the surplus water of the lake, which was 18 acres in extent, and this water formed a small stream extending for some miles. The floor of the older part of the basement of the hall was usually covered by this sewage-polluted water, boards being laid down for the servants to walk upon, and in wet weather they were dependent upon a pump to keep the water at this normal level. Two of the water-closets were situated in the centre of the building and had no external ventilation whatever. None of the closets had any ventilated lobbies; soil-pipes and drains extended in all directions, while D-traps were used everywhere. An ancient cesspool was found under the middle of the private drawing-room and had probably belonged to a former building, as no cause could be assigned for its existence. When this cesspool was opened it appeared as though it had been but recently used, no doubt owing to the water-logged condition of the ground.

In sinking for the well the pipes were driven through a chalky clay with boulders at intervals. At a depth of about 80 ft. there was obtained in small quantities a milky water charged with recent sewage and ammonia. After going down to 100 ft. the water was found to be if anything worse and the well was abandoned. An analysis of the water taken from the stream (from which a ram pumped the domestic supply to the house) notwithstanding its questionable surroundings gave very good results. It is not stated under what circumstances this last analysis was made, but probably if the sample was taken at any other time than after a heavy downpour of rain this result might be expected. Any moderate quantity of water collected by the stream after filtering through the upper 6 in. layer of the living earth where bacterial life is most active, and above the point of direct pollution from the old culvert and cesspool, would yield a result altogether different from that to be expected from the water taken from a water-logged basin polluted by years of soakage from the sewage of the house, though it may have passed through any quantity of dead earth where the action would be only mechanical; chalk marl would also be a very bad medium for this purpose.

REPORT AND SUGGESTIONS.

(See Plans No. 1 to No. 12.)

106. *The Roof.*—The main roof is divided by chimney stacks into three principal bays; the two outer bays are again divided into four equal parts, each part being covered by a hipped slate roof surrounded by lead gutters. On the north-west end of the central bay there is a room formed in a curbed roof, having two dormer windows, whilst a third dormer window gives access to the roof. The whole of the central bay and this room are covered with lead, with the exception, of course, of the skylights over the main and the second staircases and of the lantern light over the centre of the hall.

107. *Rain-water Pipe* **A** is a 4½ in. seamed lead pipe which conducts the water from the west bay into cistern **Q**.

108. *Recommendation.*—This pipe will remain as at present, the top being fitted with a galvanised wire guard.

109. *Rain-water Pipe* **B** is a similar pipe which carries the water from the whole of the north bay and from nearly half of the central bay and delivers it into cistern **Q**.

Note E.—A part of this water first passes through a trough gutter under the floor of the room in the roof (see plan 3); this gutter has sunk in the middle and is half full of mud. The front gutter has evidently been used as a receptacle for bedroom slops; as the water from cistern Q is drawn at the sinks this practice is a very serious evil.

110. *Recommendation.*—This pipe **B** is to be removed and a 4 in. galvanised head fixed, the outlet from which is connected by means of a 4 in. branch into new rain-water pipe **C**, the present communication from north bay cut off, and the brickwork and gutter made good. A new head and pipe **C** similar to last is to be fixed as shown on amended plan, carried down and connected directly with the new rain-water drain (see *Note B*). Cut a fresh outlet on the S.E. side of cistern-room into north bay and reverse the fall of existing gutter between it and the old trough gutter; which last is to be removed and any work disturbed made good, including the connexion between gutters through parapet wall.

Note F.—The use of a gully where there is a separate drain for rain-water is a disadvantage, as it forms a receptacle for dead leaves and dirt. An eye must be provided at the foot of each pipe to allow for clearing same. These inspection eyes are made in the form of a square cast-iron box with the necessary sockets and cap.

111. *Rain-water Pipe* **D** receives the water from the larger portion of the central bay and is a 5 in. seamed lead pipe carried down in an unused flue. It acts as a soil and ventilating pipe to water-closet **T** and is connected with a cesspool in the cellar. This pipe having been fixed with insufficient lead tacks has torn in two places, the worst fracture being just below the junction of the arm from the water-closet. The waste water from sink **JJ** and from the bath also discharges into this pipe.

Note G.—Owing to the pipe being in a flue which is open at the top a considerable time might pass before the defect would be discovered, the leaking water running down inside the flue and soaking into the cesspool round the course of the drain. The practice of using empty flues as drain ventilators and as receptacles for soil-pipes is, of course, a highly dangerous one.

112. *Recommendations.*—This pipe must be done away with entirely and the flue below the fracture must be exposed on one side and thoroughly cleansed, dried, and lime-washed before being made good. Air-bricks should be inserted at the foot to admit a current of air to pass through it. The rain-water can be carried from the flat in a 3½ in. strong galvanised cast-iron pipe with caulked lead joint in the same course as before as far as ceiling of cellar, it is then to be carried along ceiling under hall and breakfast-room and connected into new rain-water drain as shown on plan No. 11. Moveable casings should be fixed to flue where this pipe passes through the corridors for access to same.

113. *Rain-water Pipes* **E** *and* **F** are 4½ in. seamed lead pipes which take the water from the south and east bays respectively; they are connected directly with the brick drains in the cellar.

114. *Recommendation.*—Connect these pipes with new rain-water drain.

115. *Rain-water Pipe* **G**. The roof over the wing is some 16 ft. lower than the main roof. At the south-west end there is a shallow lead-lined tank **Q** (see plan No. 7), measuring about 30 ft. by 20 ft. by 9 in. deep, which is capable of holding some 2000 gallons. There are draw-off pipes from this tank to the several sinks on ground floor with a standing waste-pipe and overflow-pipe, both of which are connected with rain-water pipe **G**, which last is immediately connected with the drain.

Note H.—Owing to this tank being very shallow it is covered with a vegetable growth. Also on account of the extensive and uncovered surface in warm or windy weather evaporation must be very rapid. The decomposed remains of several young birds could be seen, evidently having been washed down from nests in the rain-water heads.

116. *Recommendations.*—The tank is to be removed and a properly formed 7 lb. lead flat is to be substituted; also the present rain-water pipe is to be altered and connected directly with new rain-water drain.

The water from the two valley gutters is now carried into the tank through a trough gutter under the roof; this trough gutter is very dirty.

The trough gutter is to be removed. The two valley gutters are to be taken up and re-formed at a lower level to deliver into new galvanised cast-iron 3½ in. rain-water pipes (**H** and **I**) with heads, and are carried down and deliver into new rain-water drain. All slating and lead or other flashing is to be made good.

117. *Rain-water Pipe* **J**.—The roof over the kitchen and scullery is composed of slate with lead gutters. The rain-water pipe **J** is also a soil-pipe from water-closet **X** and is a 4 in. seamed lead pipe carried down into the drain inside in the angle by the sink, with a branch from back gutter over kitchen. This pipe drops into a brick pit forming a trap.

118. *Recommendation.*—Rain-water pipe **J**, to which are now added pipes **K** and **L**. Cut out **J** and provide a new 3½ in. drawn lead soil and ventilating pipe, 10 lb. to the foot run, to be carried up on face of external wall of new side-entrance passage, to receive branch from water-closet **X**. Firmly fix this pipe to wall with 7 lb. cast lead tacks. Three pairs of tacks to be used to each length of pipe. This pipe is to be carried up to a distance of 3 ft. above parapet wall, clear of all chimneys and secured by means of an iron collar and tie; the top is to be fitted with a copper-wire guard. Connect this pipe to new drain with a brass thimble and

protect the lowest length to a height of 7ft. with a stout wood or iron casing.

119. *Rain-water Pipe* **K**.—Provide and fix new 4 in. galvanised cast-iron angle-head, with 4 in. galvanised cast-iron down-pipe, connected with new rain-water drain.

120. *Rain-water Pipe* **L**.—Supply a new 4 in. head and pipe to correspond with last, connected into rain-water drain to take water from E. corner of roof after alterations.

121. Rain-water pipes **M** and **N**. These are short pipes which take the water from outbuildings and deliver into two butts, underneath which are gutters connected into the existing drainage system.

122. *Recommendation.*—Clear away old butts, stands, pipes, &c., and provide and fix two new 3 in. galvanised cast-iron pipes properly connected into new rain-water drain.

123. *Cistern* **O**, which is lead-lined, is in the roof and access to it is obtained through a dormer; this cistern has no lid and is in consequence very dirty. The trumpet-mouthed standing waste-pipe is connected into the side of the D-trap of water-closet **S**. The cistern holds about 200 gallons and supplies sinks **JJ** and **KK**, water-closets **S** and **T** and bath.

124. *Recommendations.*—This cistern will be dispensed with and a galvanised iron cistern to hold 400 gallons (**O**) will be fixed in the room in the roof, which will be used as a cistern-room (plan No. 3). A 2 in. lead overflow-pipe is to be carried through the wall to deliver into the front gutter. The cistern is to be provided with a wood cover and will be used for the supply of hot and cold water to the three baths and the several sinks. Drill for and connect at the side of the cistern 6 in. above the bottom of the same two 1¼ in. strong galvanised iron pipes with a 1¼ in. screw-down gun-metal stopcock fixed in each close to the cistern, and continue one down to the level of the first-floor and follow on with a 1 in. pipe to supply the ground-floor. Connect ¾ in. branches from this down service-pipe to supply sinks; the other pipe is carried to supply the visitors' and family baths on second and first floors, also housemaid's sink **JJ**. There is to be a copper float-valve fixed in this cistern in connexion with a branch from the rising main to cistern **P**, which will be so regulated as to open the valve when the water falls below the level of 4 in. This is done as a protection against the occurrence of an accident in connexion with the kitchen boiler in the event of neglect on the part of the person responsible to start the ram to charge cistern **C**. By having the supply to the sinks taken from a level 6 in. above that of the one to the boiler attention will be drawn to the omission owing to the absence of water at the several sinks. Should this fail the float will a little later provide the necessary supply for the boiler but not for the sinks. With a supply of more than doubtful purity a filter would have to be introduced through which this supplemental supply would pass. A separate 1 in. strong galvanised iron pipe is to be carried from the bottom of the cistern into the hot-water cylinder (see par. 165).

125. *Cistern* **P** is lead-lined and holds about 150 gallons; access to it is gained through a trap in the floor of the bedroom above. It is supplied by a separate branch from the rising main to **O**. There is a 1 in. standing waste-pipe in the cistern which connects into the trap of water-closet **V**. The cistern supplies water-closets **V**, **W**, and the hot-water system through a small supply cistern in the housemaid's closet, the overflow from which last is also connected with the trap of water-closet **V**. The housemaid's sink **KK** is also supplied from this source.

Note I.—The position of the cistern under the floor of the bedroom is objectionable and also the connexion of the waste with the trap of the water-closet. The cistern supplying a valve or pan-closet should not also supply a sink.

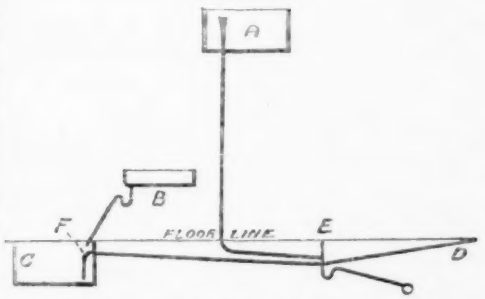
126. *Recommendations.*—Remove the cistern and make good the work disturbed. Provide and fix a second galvanised iron cistern **P** in the room in the roof (plan No. 3) to be used exclusively to supply the closets. Provide an overflow-pipe as described for cistern **O** and provide and fix a 1¼ in. stout lead supply-pipe carried down to the level of the first-floor and fitted immediately at the side of the cistern with a 1¼ in. screw-down gun-metal stopcock. Continue on 1 in. branch pipes for water-closets **S**, **T**, **U**, and **V** with a ¾ in. branch to water-closets **W** and **X**.

127. *Cistern* **Q** is large and shallow (see par. 115), is formed on the flat, and is capable of holding about 2000 gallons. It collects the rain-water from an area of some 5800 ft.—viz., nearly half of the main roof and the whole of the wing excepting the kitchen. This cistern overflows into rain-water pipe **G**, which is a very necessary provision, as the capacity of the tank when its contents are on a level with the overflow-pipe is but a little more than is represented by ¼ in. of rainfall. It is therefore evident that in wet weather a very large quantity must run to waste. This cistern supplies a tap at each of the ground floor sinks and a very bad supply to closet **XX**.

128. *Recommendation.*—(See par. 116).

129. *Cistern* **R**, which is large and lead-lined, is carried upon wood framing in the scullery and holds about 300 gallons (see plan No. 5). It supplies the ground floor sink and a supply cistern to the low-pressure boiler in the servants' hall, the overflow-pipe from which last is carried through the floor of the room and any waste water soaks into the ground in the cellar. The treatment of the overflow from the large cistern illustrates a well-intentioned if abortive attempt on the part of some local sanitary luminary to bestow upon the mansion some of the blessings of advanced sanitation. The overflow is carried off by a 3 in. seamed lead pipe and no doubt this cistern was originally supplied by rain-water. This overflow-pipe is immediately connected with the brick drain from the scullery sink. The following diagram (Fig. 6) will more clearly describe the improvement:—

FIG. 6.



A, Cistern with overflow-pipe into new pipe drain. B, Scullery sink. C, Brick-built fat trap (see Fig. 25 in the previous report of THE LANCET Special Commission on the Relative Efficiency and Cost of Plumbers' Work). D, Untrapped drain from the floor of the larder. E, External gully by the side door.

The drain and bend from the fat trap having become blocked a hole had been cut at **F** to clear the same. A smell resulted at **D** and **E** and these gratings were then stopped off with tiles, leaving **A** to act as an unsuspected ventilator to the fat trap, dirty drain, and gully **E**.

130. *Recommendations.*—This cistern will be removed. A Lawrence steriliser capable of dealing with 100 gallons of water per hour will be fixed with all the necessary brickwork flues, &c., at **Z** in the kitchen. Access to the small furnace of the steriliser will be had by means of some brick steps and a platform, a ¾ in. lead service-pipe from rising main to cistern **O** will be carried down to charge the steriliser and the end will be fitted with a ¾ in. screw-down gun-metal bibcock. A 1 in. stout block-tin or galvanised iron pipe is to be carried down from the outlet of the steriliser and connected with a ram fixed on the level of the kitchen floor. If preferred the steriliser and ram may be fixed in a small pump-house adjoining, and accessible to, the kitchen. The waste water from the ram, can be carried into a gully. Carry up from the ram a 1¼ in. stout service-pipe of block-tin or galvanised iron and make the same to deliver over cistern **O**, bring down in the same course a ½ in. warning-pipe to terminate at the scullery sink or other suitable point. This pipe may be fitted with a hydraulic bell.

Note J.—It is better to use a double ram worked off the main instead of using the sterilised water for this purpose with an ordinary ram.

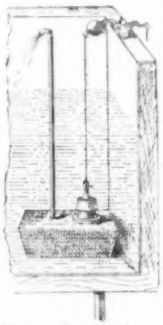
131. *Water closets.*—Closet **S** is unprovided with a window, although it is situated against an outer wall; it receives a borrowed light from a fixed sash in the partition of the adjoining bedroom. It is intended to be ventilated by means of a square hole in the ceiling fitted with perforated zinc, which if it were not blocked with dirt would allow the air of the closet to pass on to cistern **O**. It is a pan-closet

(Fig. 7) (see par. 22 of the previous report of THE LANCET Special Commission on the Relative Efficiency and Cost of Plumbers' Work) and is supplied through a service-box in

FIG. 7.

Pan closet.

FIG. 8.



Cistern and service-box.

cistern **O** (see Fig. 8). There is the usual lead tray under the closet with an overflow-pipe into the D-trap (see Fig. 9) which is fitted under the closet.

132. *Recommendations.*—Form a window in the external wall 5 ft. by 3 ft. with double-hung sash, &c., complete. Make good the hole into the roof. Cut away for and lower

FIG. 9.[2]

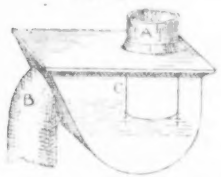


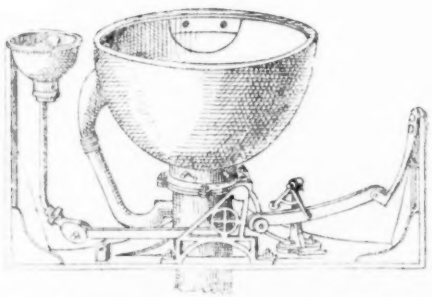
FIG. 10.

Anti-D-trap.

the floor of this water-closet, as shown on section and plan (Fig. 12). Access to this closet will now be had by descending five steps. This will allow headway for a false ceiling to be formed over the closet and about 3 ft. below the present ceiling (see Fig. 12). A second window is to be made in the external wall between these ceilings and the sash hung on centres for ventilation; alter doorway and partitions to enclose closet and form new lobby. Prepare the floor and the walls for and line with white tile throughout. Provide and fix a pedestal wash-down closet with a flushing rim and an earthenware slop top fitted with a mahogany hinged seat and lid. Fix a drawn 8 lb. lead **P** or anti-**D** trap (Fig. 10) under the same and carry a short branch of 10 lb. 3½ in. drawn-lead soil-pipe from the trap of the closet through the external wall to connect to soil-pipe **G G** with a 2 in. anti-syphonage pipe carried from out-go of trap into anti-syphonage pipe from closet **W**. Provide and fix on iron brackets in the closet some 4 ft. or 5 ft. above the basin a three gallon, silent, water-waste-preventing syphon cistern to supply this closet. Connect this cistern to the down service-pipe from cistern **P** by a short ¾ in. stout lead branch pipe fitted with a ¾ in. screw-down gun-metal stopcock and a ½ in. ball-valve to the cistern. Provide a ¾ in. lead overflow-pipe with brass connexion to the cisterns and carry it through the external wall. Lay on water to the basin of the closet by a 1½ in. lead service-pipe properly fixed with cast-lead tacks (see pars. 24 and 30 of the previous report of THE LANCET Special Commission on the Relative Efficiency and Cost of Plumbers' Work).

133. *Closet* **T** is of the old Bramah pattern (Fig. 11) with a fan spreader (see par. 27 of the previous report of THE LANCET Special Commission on the Relative Efficiency and Cost of Plumbers' Work). Like water-closet **S** it has no direct communication with the outer air, having only a borrowed light from the bathroom (see plan No. 6). It is supplied from cistern **O** through a service box and owing to the length and smallness of the (¾ in.) pipe from the cistern the handle has to be held up a considerable time before the water reaches the pan. There is a lead safe under the water-closet which is connected with the soil-pipe of the closet; the waste of this safe is trapped in itself and is kept charged by means of a weeping pipe from the down service-pipe to the arm of the closet basin.

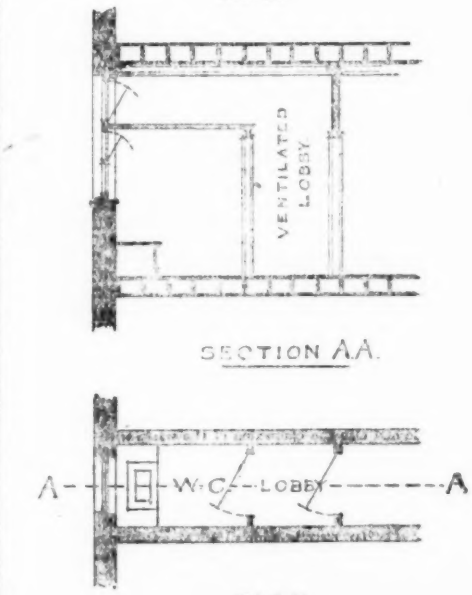
FIG. 11.



There is a D-trap under the closet (see par. 25 of the previous report of THE LANCET Special Commission on the Relative Efficiency and Cost of Plumbers' Work).

134. *Recommendations.*—Remove this closet, clear away all connexions and make good the floor and ceiling. Erect a stud, lath and plaster, partition across present family bedroom, as shown on amended plan No. 9, with a 2 in. mahogany framed and glazed partition to enclose window, and form new enclosure to divide water-closet from bathroom, after the removal of old partition. Cut new doorway to connect bathroom with bedroom on east side, and provide all necessary doors, linings, skirtings, &c., to form a complete suite of rooms. The lobby to the closet is ventilated as in closets **S** and **U**, Fig. 12 Supply and fix in new closet a valve closet of best make. Fix anti-D-trap under same with soil-pipe **FF**, anti-syphonage pipe, and supply, &c., as described for closet **U**.

FIG. 12.



135. *Recommendations.*—Closet **U** (new). Form a stout stud lath and plaster partition across the end of the north-east bedroom, as shown on amended plan, with a new window of similar height to those adjoining and 3 ft. wide, fitted with double hung sashes. The lobby is ventilated by a window

[2] For description see par. 23 of the previous report of THE LANCET Special Commission on the Relative Efficiency and Cost of Plumbers' Work.

between the present ceiling and the false ceiling enclosing water-closet as in closet **S**. Render the walls of the partition on each side down to the floor level and prepare for and tile the floor and the walls throughout. Provide and fix a pedestal valve closet of the best make (see Fig. 13) and

FIG. 13.

lay on a 1 in. branch service-pipe to the arm of the basin from the new 1¼ in. down service-pipe from cistern **P** fitted with a 1¼ in. screw-down gun-metal stopcock under the seat. Fix an 8 lb. lead anti-D-trap under, as in closet **S**, and carry a stout 3½ in. 10 lb. drawn lead soil-pipe through the external wall connected to soil-pipe **HH**, fix a 2 in. anti-syphonage pipe from out-go of trap connected into soil-pipe 3 ft. above level of floor, and provide and hang a French polished mahogany seat and lid.

136. *Closet* **V** is similar in all respects to closet **S**, but is provided with ample ventilation and light, having a good window. Owing, however, to the defective condition of the plastering, and to the openings between the floor boards, skirtings, &c., whenever this closet is used a smell is drawn into the adjoining bedroom, as is proved by the fact that smoke can be passed from this closet freely into the bedroom.

137. *Recommendations.*—They are in all respects the same as for water-closet **T**, excepting the treatment of the anti-syphonage pipe which is the same as closet **U**.

138. *Closet* **W** is somewhat badly placed (see plan No. 5), opening as it does directly into the billiard-room. The closet is of the kind known as a side wash-out, with pan and trap in one piece of earthenware (see par. 29, note *L*, of the previous report of THE LANCET Special Commission on the Relative Efficiency and Cost of Plumbers' Work). It is connected with a 6 in. drain-pipe continued down to the cellars and carried into the cesspool at the foot of the rain-water pipe **D**.

139. *Recommendations.* — The position of this closet would be much improved if it were arranged as shown on the amended plan No. 8, by which means a ventilated lobby is placed between it and the cloak-room. The doorway on the water-closet side of the billiard-room must be filled in with wood studs and lathed and plastered, and the floor and the walls of the closet and the lobby must be prepared and tiled throughout. Notice that the cloak-room in this case has to depend upon a borrowed light, being enclosed upon two sides with a glass partition. The closet is to be replaced by a good pedestal wash-down closet, with an 8 lb. lead syphon trap. Carry a stout length of 4 in. 10 lb. lead soil-pipe from the trap through the external wall at the ground level, with brass thimble (see Fig. 14 also par. 36 of the previous report of THE LANCET Special Commission on the Relative Efficiency and Cost of Plumbers' Work) on end to connect into short iron drain to manhole. Carry up the usual anti-syphonage pipe described in par. 150, provide a flushing cistern, lay on water to the same with a stout branch of ¾ in. lead pipe from the down-service pipe from cistern **P**, provide a stopcock, &c., make

FIG. 14.

Thimble.

seat and lid, and in all details finish as described for water-closet **T**.

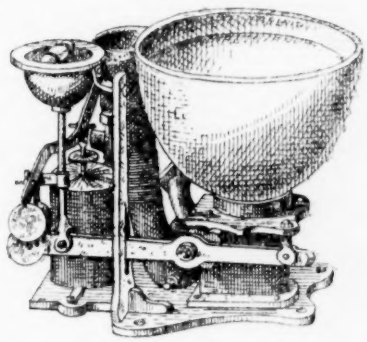
140. *Closet* **X** is a pan closet supplied with water from cistern **Q** through a valve under the seat. The D-trap below is connected with the rain-water pipe **J** by a stout branch of 4 in. lead pipe. It is not provided with a lead safe, which in this case is unnecessary. There is a good window for light and ventilation, but owing to the outlet of the gutter of the roof over the kitchen being just underneath the sill there is the risk of bad air entering from the foul soil-pipe **J**. At times this closet is useless, owing to its defective water-supply.

141. *Recommendations.*— Replace the closet by one with a short hopper basin having a flushing rim. The basin is fitted into a lead cone and fitted into an 8 lb. lead P-trap. Fix an earthenware slop top and a mahogany French polished seat and lid, both to be hinged. Continue a short length of 3½ in. 10 lb. drawn-lead soil-pipe through the external wall. This is to be connected into soil-pipe **J** (par. 117) with an anti-syphonage-pipe as described for closet **U**. Provide and fix on brackets a cistern fitted as described for closet **S**. Prepare for and lay tile floor. It is not so necessary to line these walls with tiles if they are properly plastered down to the floor, the walls being of 14 in. brickwork. Make good the skirting round the back of the closet and the linings after the alteration to the window. Cut away and form a skylight in passage where shown by dotted lines.

Note K.—Care is required in selecting these closets as some of this shape are liable when flushed to form a vortex in the trap which is then cleared with difficulty.

142. *Closet* **Y**. *Recommendations.*—Increase size of present doorway and form brick arch. Set back external door and frame to form lobby as shown on amended plan No. 8. The dark cupboard under the servants' staircase is to be studded round at the back and one side is to be lathed and plastered, and the cupboard, floor and walls are to be prepared and tiled throughout. A window about 2 ft. 9 in. by 4 ft. is first to be cut in the external wall and fitted with double hung sashes glazed with obscured glass. There being insufficient headway under these stairs above the water-closet in which to fix a flushing cistern, a good valve closet (see Fig. 15, also par. 26 of the previous report of THE LANCET Special Commission on the Relative Efficiency and Cost of Plumbers' Work) is to be provided and

FIG. 15.



fixed facing the new window. A 1 in. branch pipe is to be connected with the service-pipe to water-closet **W** and is to be fitted with a screw-down wheel stop-cock under the seat of the water-closet. Provide a French polished mahogany hinged seat and a lid with a moveable riser or front. Provide and fix an 8 lb. lead syphon trap (Fig. 16) under the water-closet, this being connected with the heavy cast-iron 5 in. soil-pipe by a brass thimble (see par. 36 of the previous report of THE LANCET Special Commission on the Relative Efficiency and Cost of Plumbers' Work) and carried through the external wall into the manhole. Should it be possible to connect a 2 in. anti-syphonage pipe into that from water-closet **W** a 4 in. iron

FIG. 16.

Syphon trap.

drain will suffice. Fix a short piece of 2½ in. thick York stone to support the brickwork where the pipe passes through the external wall.

143. *Closets* **AA**, **BB** (see plan No. 5) are intended for the servants' use, **AA** being for women and **BB** for men. They are fitted with hopper pans and fan flushes (Fig. 17, see par. 31 of the previous report of THE LANCET Special Commission on the Relative Efficiency and Cost of Plumbers' Work) and are supplied from cistern **R** by means of cottage valves fixed under the seat. They discharge by a short drain-pipe into cesspool. The foregoing on reference to plan No. 5 will be seen to be an objectionable not to say indecent arrangement, in frosty weather, when no water is available, the state of these closets must be very bad. By the alteration shown on the amended plan these closets are still retained as earth closets for the use of the men servants; **EE** is added at kitchen entrance for women and **CC** and **DD** are provided for the use of the male occupants of the mansion and are screened from the gardens by shrubs.

FIG. 17.

144. *Recommendations.*—The old closets are to be removed, together with all the old drains in connexion with them, also any wet earth, which last is to be replaced with good dry brick rubbish or available dry earth, and covered with 4 in. of cement concrete after the alterations shown on the plan (No. 8) have been carried out. Cement the wall and floor, this last finished with a slight fall to back of closet, and line with tiles. These closets are raised upon two brick steps, and are not provided with any form of apparatus other than a box at the side to hold dry earth, together with a small shovel with which to throw it over the dejecta, and it is well to keep a hearth-brush in the closet for the removal of any earth that falls upon the seat. The floor of the catch under the seat being cemented one or two shovelfuls of earth are sprinkled over the same after each removal of the soil. This absorbs the urine. Every day or every week the accumulation is removed through a large trap-door at the back of the closet. This door has a space of some 3 in. at the bottom to allow of a free circulation of air. These closets, if regularly attended to, are entirely free from any objectionable smell and the humus derived from them will be found to be unequalled as a manure for the garden (see Plan 8, also par. 209).

145. *Closet* **EE**. *Recommendations.*—Provide and fix a pedestal closet with a bottom outlet (see Fig. 6 in the previous report of THE LANCET Special Commission on the Relative Efficiency and Cost of Plumbers' Work) and an 8 lb. lead syphon trap. Supply and fix on brackets a 3-gallon silent water-waste-preventing cistern connected with the closet by a 1½ in. service pipe. Lay on water to this cistern by a ¾ in. branch pipe from the service-pipe to water-closet and put a ½ in. ball valve in the cistern. This service-pipe is to be fitted with a ¾ in. screw-down stop-cock close to the flushing cistern. Carry a ¾ in. lead overflow-pipe through the external wall. Connect the outgoing pipe of the trap to a stout iron drain-pipe, all to be as described for water-closet **O**. The floor and the walls are to be prepared and lined with tiles throughout.

146. *Soil-pipe* **D** has already been described (see par. 111). It receives the contents of closet **T** and sink **JJ**, and the waste water from bath.

147. *Recommendation.*—This pipe will be removed entirely and a new 3½ in. 10 lb. lead soil-pipe **FF** is to be provided and fixed to connect with closet **T** with six 7 lb. cast-lead tacks to each 10 ft. length of pipe, the tacks being placed in pairs at equal distances apart. The bottom of the soil-pipe is to be connected by a brass thimble with the iron drain to the manhole. The branch soil-pipe from closet **T** is to be connected, the pipe is to be carried up and finish about 3 ft. above the curb roof and is to be properly secured by an iron stay. A copper-wire guard is to be fixed on the pipe with a 2 in. anti-syphonage pipe from outgo of trap connected to soil-pipe 3 ft. above floor level.

148. *Soil-pipe* **GG** is a 4½ in. seamed lead pipe which is carried down internally and receives the discharge from closets **S** and **V** as well as the waste water from the housemaid's sink **KK**. It is unventilated, and the longitudinal branch connexion with water-closet **V** is much corroded and perforated (see note *N* in the previous report of THE LANCET Special Commission on the Relative Efficiency and Cost of Plumbers' Work). It dips into a small brick pit at the foot, and is connected with a cesspool by a brick drain passing under the lobby of the dining-room.

149. *Recommendation.*—Provide and fix a new 3½ in. drawn-lead soil pipe **GG** connected to water-closets **S** and **V**, finished in all respects as described for the last closet, excepting only the anti-syphonage pipe, which is as follows:—

150. *Anti-syphonage Pipe.*—A strong 2 in. lead anti-syphonage pipe (see note *O*, par. 37 of the previous report of THE LANCET Special Commission on the Relative Efficiency and Cost of Plumbers' Work) is to be fixed at the side of this soil-pipe with cast-lead tacks weighing 4 lb. each, one pair of tacks being used for every 3 ft. 6 in. of the pipe. The bottom of this pipe is to be connected with the outgoing pipe of the trap of water-closet **W** with branches to the traps of closets **S** and **V**. The upper end of this pipe is to finish about 3 ft. above the curb roof and is to be secured by an iron stay. A copper-wire guard is to be fixed on the top of the pipe.

151. *Soil-pipe* **HH** is new. It is similar to the last and is connected with the branch from water-closet **U**. It finishes some 3 ft. above the coping. The anti-syphonage pipe is carried from the trap of closet **U** and is connected into the side of the soil-pipe 3 ft. above the branch connexion of the closet.

152. *Soil-pipe* **J**.—This has been described in par. 117.

153. *Recommendation.*—A new soil-pipe (described in par. 118).

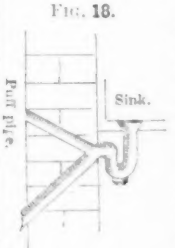
154. *Soil-pipe* **II** from water-closet **W** is a short 4½ in. lead seamed pipe which passes through the external wall and is connected with the drain communicating with cesspool. There is a settlement where this pipe passes through the wall which has compressed the pipe. The pipe has also been eaten through by rats, thus forming a means of communication between the old brick drain and the interior of water-closet.

155. *Recommendation.*—This will be replaced by an iron pipe as described for water-closet **W**.

156. *Sink* **J J** (plan No. 7), which is small and lined with lead, is fixed in a cupboard on the landing and is supplied from cistern **O**. The waste-pipe is connected with soil-pipe **D**, already referred to in par. 111 (see also par. 35 of the previous report of THE LANCET Special Commission on the Relative Efficiency and Cost of Plumbers' Work). There is a small D-trap under the sink, but the waste-pipe is unventilated.

157. *Recommendations.*—A doorway into the adjoining box-room is to be formed after the removal of the present enclosure to the sink and a moulded four-panel door and frame are to be provided and hung. A quarter framed partition is to be fixed to divide the box-room and to enclose one window, to convert same into a second bath-room and a housemaid's closet; the existing doorway is to be shifted as shown on amended plan No. 10; lath and plaster the partition on both sides down to the floor, and provide and fix skirting round the same to match existing ditto. There is also to be provided and fixed upon proper bearers under the window a white glazed earthenware sink 2 ft. 6 in. by 1 ft. 6 in. and a 1½ in. strong lead waste-pipe from the same is to be carried through the external wall, with a lead syphon trap fitted with brass cleansing screw fixed under the sink. A 1½ in. short anti-syphonage pipe is to be connected to the outgoing pipe of the trap, terminating just outside the external wall, and a cross-wire guard is to be fixed over the end of the same (Fig. 18). A 2½ in. galvanised cast-iron pipe **UU** is to be supplied and fixed externally, the upper end standing some 2 ft. above the parapet wall and the lower end being fitted with a shoe to half channel laid to gully. A junction in this pipe is to be fixed to receive and connect the waste-pipe of this sink and bath waste-pipe. A wire guard is to be fixed on the top of the pipe. All the joints are to be made with yarn

FIG. 18.



and it is necessary to red lead the ends, and the sockets of each pipe are to be painted before fixing. A ¾ in. stout lead service-pipe is to be laid on to this sink from the down service-pipe from cistern **H** fitted with a screw-down horizontal bibcock. Also a similar ¾ in. stopcock is to be fixed in the service-pipe to the sink. The floor of this closet under the sink should be covered for a space of 5 ft. by the full width with 7 lb. lead, close copper-nailed round and across.

Note L.—The use of lead pipe for long lengths of bath or sink wastes on external walls is better avoided, unless expansion joints are provided above and below the junctions of all branch pipes into same.

158. *Sink* **KK** (Plan No. 6) is lead-lined and has a 1 in. waste-pipe trapped in itself. The sink is supplied from cisterns **P** and **Q** and the waste water is carried into soil-pipe **GG**. Occasionally the trap syphons out when closet **V** is used.

159. *Recommendations* (Plan No. 9).—Remove sink and provide a sink as described for sink **JJ**, and fix by window connected with waste-pipe **TT** and finished in all respects similar to **JJ**.

160. *Sinks* **LL, MM, NN, OO, QQ, RR,** and **SS** are all lead-lined and are of various sizes. Cold water is supplied from cistern **R**, soft water from cistern **Q**, and hot water from cistern **P**. All these sinks are immediately connected with the drain, the waste-pipes dipping into brick-built traps.

161. *Recommendations.* — The sinks marked **LL, MM, QQ, RR,** and **SS** are to be fitted with fire-clay enamelled sinks about 24 in. by 16 in., having 1¼ in. lead waste-pipes carried over external gullies and fitted with syphon traps with cleansing screws. Each trap is to have an anti-syphonage pipe as described for sink **JJ**. The cold services are to be taken from the 1 in. service-pipe from cistern **O** to the hot-water cylinder in the kitchen, with ¾ in. horizontal screw-down high-pressure bibcocks to each sink. A similar stopcock is also to be fixed in each service. Sinks **NN** and **OO** are to be of wood, with a division in the centre, about 3 ft. by 1 ft. 6 in. and 1 ft. deep. They are to be lined with pewter and in other respects are to be treated as the last excepting that there is to be in each division a brass washer and plug. Either side of these sinks is to be provided with a grooved draining board, the whole covered with pewter. The present service to small-feed cistern boiler in servants' hall must be re-connected to down service from **O**.

162. *Sink* **PP** (scullery) is a large stone sink (see note *O* in the previous report of THE LANCET Special Commission on the Relative Efficiency and Cost of Plumbers' Work) supplied from cisterns **R** and **Q**, the present arrangements of which have been described under cistern **R**. (See par. 129.)

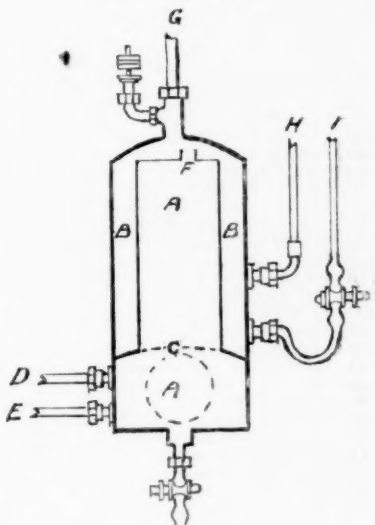
163. *Recommendations.*—The scullery is to be partitioned off as shown on the amended plan No. 8 to form closet **E E** with open lobby and passage to the kitchen, the windows in the scullery being now appropriated by the water-closet. A new one must be formed looking into the new side entrance passage to light and ventilate the scullery. The partitions are to be built of 9 in. brickwork. The interior of the scullery and the larders is to be cemented and lined with white glazed tiles, but the remaining portions of the partitions can be finished in plaster. The floor throughout should be paved with brick or Dutch tiles laid on a proper concrete bed. A small lean-to roof is to be placed as indicated on plan No. 9 to shield larder windows from the western sun, and an extra sash is to be fixed in the end larder. Provide and fix a glazed stoneware sink **PP**, 3 ft. by 1 ft. 8 in., placed on dwarf brick walls, with a 2 in. stout lead waste-pipe carried through the back wall chased in the same to deliver into flushing gully. Fix under the sink a lead syphon trap fitted with a brass cleansing cap and screw. A 1½ in. anti-syphonage pipe is to be connected just by the outgoing pipe of the trap and is to terminate externally; the end of the same is to be protected by a wire guard. Provide a ¾ in. screw-down bibcock and connect with a stout ¾ in. lead branch pipe from the 1 in. down service pipe from cistern **H**. A screw-down stopcock is also to be fitted in this short service-pipe. Provide and fix under the plate-rack a draining-board covered in pewter to drain into the sink. Should other sinks for washing vegetables be necessary they can be had in stoneware and treated in the same manner as the last, delivering by separate waste-pipe into the external gully.

Note M.—Where as in the present instance a biological filter is used the fat must be kept out of the drain or the filter will become clogged. An earthenware fat-trap gully must be substituted for the flushing gully and the accumulations removed and superficially buried at regular intervals.

164. *Hot Water System.*—There is a circulating system from the boiler in the kitchen to a tank fixed in the housemaid's closet on the first-floor half landing. The expansion-pipe is turned through the external wall (see par. 52 of the previous report of THE LANCET Special Commission on the Relative Efficiency and Cost of Plumbers' Work). A small supply cistern at the side of the tank furnishes the supply, being connected by a ball valve to cistern **P**, the overflow-pipe from this small cistern is connected into the waste-pipe of the sink above the trap. There are draw-off taps at the bath and to sink **K K** and all those on the ground-floor excepting in the servants' hall.

165. *Recommendations.*—Provide and fix in the recess at the side of the kitchen range a 50 gallon galvanised iron circulating hot water cylinder connected to the boiler by 1½ in. flow and return steam-pipe (see Fig. 23 in the previous report of THE LANCET Special Commission on the Relative Efficiency and Cost of Plumbers' Work). Carry up from the top of the boiler a 1¼ in. steam-pipe and bring the same through the wall of the chimney breast and fit with a dead weight safety valve. Fig. 19 shows a Lawrence patent cylinder and its object is to limit the amount of incrustation in it and the pipes by using the water in the boiler only for the purpose of heating that in the cylinder. Its description is as follows: **A** is an internal chamber rising from a diaphragm **C**, below which are connected the flow-pipe **D** and return-pipe **E** from the boiler; access to this chamber is provided for by means of a manhole. **F** is an open tube passing up to within about half-an-inch of the top of the outer jacket of **B** and serves to connect the two chambers **A** and **B**, the pressure of water of course being the same in each. Though thus connected it is found in practice that the two waters do not mix to any appreciable extent owing to the variation of temperature causing a difference in gravity. **G** is the flow-pipe to the bath, &c., and **H** the return-pipe to the cylinder, **I** being the cold supply-pipe from cistern **O**. Through this arrangement, after the salts contained in the water in the boiler and in the heat interchanger or chamber **A** have been thrown down, comparatively little additional deposit

FIG. 19 (Par. 165).



takes place. The water, however, from this or from any other form of circulating apparatus cannot be regarded as having been sterilised by heat owing to the great pressure generally present necessitating a much higher temperature than is required in an open vessel to raise the water to the boiling point. The use of such a cylinder as above described

is by no means a necessity where a steriliser is fixed (see par. 130), as nearly all the salts of lime and magnesia will have been eliminated previously to the water entering the boiler. The 1¼ in. flow-pipe from the cylinder divides into two 1 in. steam pipes, one pipe passing along inside the front external wall of the wing and the other inside the back external wall, branches being carried down on each side to the several sinks; by this arrangement the presence of long lengths of branch pipes with dead water is avoided. Each sink is fitted with a ¾ in. gun-metal high-pressure, screw-down, horizontal bibcock. These two flow-pipes again unite at the end of the passage and pass up through the lavatory, housemaid's closet, and along the wall of the passage on the first-floor to the best bath-room, with branches to this bath, and the one on the second floor also to lavatory, servants' bath, and two housemaids' sinks, which last are provided with ¾ in. screw-down bibcocks like the others. The flow is continued up through the new housemaid's closet and is returned by a single pipe into the cylinder. An expansion pipe is carried from the highest point and is turned over cistern **I** in the cistern room. Provide a small expansion cylinder in this pipe above the level of the top of the cold-water cistern.

166. *The Best Bath* is composed of zinc enclosed by a mahogany framed casing. There is a lead safe below, the waste-pipe from which passes into the side of the D-trap of water-closet **T**. The bath waste-pipe is fitted with a running trap formed in the 1¼ in. waste-pipe and is then connected with soil-pipe **D**. The bath has a hot and cold supply, the latter from cistern **H** and the former from the hot-water tank in the housemaid's closet; this supply is very sluggish, the head of water in the hot-water tank being but little above the bath. The supplies enter at the sides through two 1 in. plug stopcocks under the bath. These are worked by iron rods and lever handles. Owing to the cocks leaking and the inside of the bath becoming rusty the lead pipe between the cocks and the inlet to the bath has been punctured to allow of the escape of any water passing the valves when shut, occasioning considerable waste of water.

167. *Recommendations*.—Disconnect the bath, make good the inlets, and fit a plug waste in the bottom of the bath; re-enamel and re-use the bath in the servants' bath-room. Disconnect the waste-pipe of the safe from the D-trap which is to be removed and carry a 1½ in. lead waste-pipe through the external wall to deliver into the open air. Fit a copper flap-valve at the end of the pipe Provide a new full-sized parallel enamelled copper bath and fix it with a vulcanite plug and plated fittings to the waste-pipe connected to the 1¼ in. lead pipe and running trap; the waste-pipe is to be carried into waste **UU** from sink **JJ**. Take from the out-go of this waste-pipe a 1¼ in. lead anti-syphonage pipe carried through the external wall fitted at the end with a copper-wire guard. Provide hot and cold overhanging screw-down plated cocks and connect with 1 in. galvanised iron pipes respectively from the down service-pipe from cistern **O**, and the hot-water system each fitted with screw-down stopcocks near the bath. Supply and fit a new mahogany bath top, refix bath casings and make good the floor, walls, and skirtings. Provide and fix a 1¼ in. plated overflow at foot of bath having a lead waste carried through external wall, the end fitted with a copper flap-valve.

168. *Second, or Visitors' Bath*.—Supply an independent cast iron best enamelled bath, with plug waste properly trapped with anti-syphonage pipe carried through external wall and connected into that from best bath. Fix wood fillet on floor and cover space under bath with 7 lb. lead. Carry 1 in overflow through external wall, the end fitted with a copper flap valve. Lay on 1 in. galvanised iron service from down service from cistern **O** fitted with screw-down stop-valve by bath. Supply screw-down overhanging plated bib-valve at foot of bath and connect to same, also a similar valve for hot water and connect with 1 in. galvanised iron service from hot-water circulation, fit overflow grating to foot of bath and carry ½ in. short lead pipe to project through external wall—the end fitted with a copper flap-valve.

169. *The Servants' Bath*.—Provide a lead safe with a 1½ in. waste-pipe carried through the external wall, fix the old zinc bath and fittings taken from the principal bath-room, carry a 1¼ in. lead waste-pipe **TT** into waste of sink **KK** and fit a running trap in the same with an anti-syphonage pipe as in the last bath. Provide lead safe and waste into open. Lay on overhanging hot and cold supply-pipe with brass screw-down bibcocks, each service provided with stopcock as last. Provide deal top and matched boarded enclosure to bath, fitted with door for access to safe.

Note N.—Happily the greater facilities for cleanliness now provided in the homes from which domestic servants are taken, together with similar opportunities offered in houses where they are employed, is producing a taste for more healthy habits among this class than prevailed formerly. It is not at all uncommon to find members of the families of the better class of mechanics who have never had a bath that they can remember unless owing to the accident of illness. The condition of these people when becoming inmates of a hospital proves this frequently.

170. *The Lavatory*.—After the alteration to the cloak-room has been carried out provide and fix under the window with moulded edge a white marble slab 1½ in. thick, the full length of opening by 1 ft. 9 in. deep fitted with two oval lavatory basins under the same, with a separate 1 in. overflow-pipe carried through the external wall to deliver over gully. Provide and fix a pull-up waste valve and connect a 1¼ in. drawn-lead syphon trap under each basin and continue the waste-pipes through the external wall to deliver into gully. Provide a 1 in. anti-syphonage pipe from the outgoing pipe of the traps to finish externally, the end being fitted with a cross-wire guard. Lay on 1 in. galvanised iron cold supply-pipes fitted with overhanging cam action plated bibcock and connect a 1 in. branch pipe from the hot-water service pipe to similar bibcocks. Provide 1 in. stopcock as before described in each service-pipe.

Note O.—It is very desirable that each internal closet should be approached by a ventilated lobby, but this in all cases is not obtainable. A more complete plan than the one adopted would have been to build an annexe at the back of the house to contain all the closets and the bathrooms, but this would not have been so applicable to the general requirements of the public.

THE WATER SUPPLY.

171. *Existing Water-Supply*.—There is a constant spring from the hills some 300 ft. above the house, the water from which is collected in a reservoir 150 ft. lower down. The overflow from this reservoir falls into the lake, the stream through which then passes on through the village which is a mile distant. This reservoir is silted up and requires thoroughly cleaning, embanking to exclude surface water, and fencing round. (See Water-storage, par. 53, &c.) The service-pipe to the mansion has only a 1½ in. bore and is altogether inadequate to the requirements. In addition there is a deep well by the bailiff's house and there is another at lodge No. 5 whilst a shallow well supplies lodge No. 8. (See plan No. 12)

172. *The Main Supply*.—Form a brick chamber 3 ft. by 3 ft. 6 in. and of the necessary depth at the side of the reservoir to form a manhole for a stop-valve in the main. Connect into the reservoir 6 in. from the bottom at this point a 4 in. heavy cast-iron main laid with the usual molten and caulked lead joints carried to a point about 20 ft. from the north-east angle of the building, where it divides into two 3 in. branches, one passing along the south-west front of the house as far as the end of the kitchen wing and the other along the garden or north-east front to a hydrant at the extreme corner of the stables. From this point a 2 in. main-pipe is carried at the side of the road past the greenhouse as far as the farm buildings, where another hydrant is to be fixed. This main must be laid in a trench at least 3 ft. deep, it must be carried in a straight line from point to point, and be (see par. 41) of even fall throughout. In the immediate neighbourhood of the house and buildings and wherever passing through made ground it must be laid upon a 6 in. concrete bed. This main pipe will have 2 in. branches to hydrants fixed at suitable points all round the house at about 20 ft. or 30 ft. from it. A 2 in. strong lead branch pipe will also be carried up to the level of the second floor to a point outside water-closet **S**. Two other points will be provided, one in the cloak-room and the other by the doorway in the passage on the first floor connecting the main and the wing buildings. These points will be fitted with handy straightway lever valves (Fig. 3) and the usual hose and connexion. A ¾ in. stout lead branch rising main will be continued from this main to supply cisterns **O** and **P** fitted with equilibrium ball valve.

SUMMARY OF EXISTING ARRANGEMENTS FOR THE DISPOSAL OF SEWAGE.

173. *The House, Stables, and Laundry* (see plan No. 12).—There is an entire absence of any regular plan of drainage, the house having under and around it a number of cesspools the overflows from which are carried into the surface-water

drain from the garden paths, which last eventually delivers into a ditch running at the side of the avenue and falling into the stream that feeds the lake. The bulk of the solid matter is caught by the cesspools, while much of the liquid soaks into the ground from the defective drain and during its lengthy passage in the ditch, but little fortunately reaching the lake excepting during heavy rains.

174. *The Gardener's Lodge (No. 5) and Farm Buildings* drain into the ditch on the north-west side of the road.

175. *The Bailiff's House (No. 6)* has midden closets, and the surface drains run into a ditch.

176. *Kitchen Gardens'* surface drains run into the pond in the garden.

177. *The Keeper's Lodge (No. 8)* drains into a cesspool.

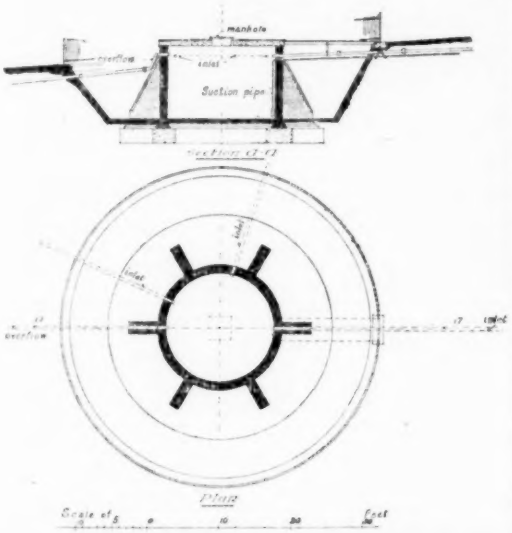
178. *Recommendation.*—The general system of proposed drainage is as follows, the details being given under different heads.

179. *The several Soil Drains* round the house (see plan No 11) are collected in a disconnecting chamber marked 9 on plan No. 12 (see also Fig. 21); a drain passes under the terrace road to a point opposite the entrance to the stables; here it turns almost due west and joins the back road by lodge No. 5. From this point it runs in a direct line to the Moncrieff cultivating tank **E**. In its course it receives the soil drain from the laundry and stables, Nos. 2 and 3, and the connexion with the pond, lodge No. 5, and farm buildings No. 7. Further details relating to these buildings will be found under separate headings.

180. *The Surface Drains* are formed entirely separate from the last and are collected so as to deliver half into the pond in the kitchen garden, while half passes into the hawhaw adjoining the drive. From this pond an overflow-pipe is carried into the ditch on the north-west side of the back road. There is also a connexion, fitted with a disconnecting chamber and sluice valve, between the pond and the main drain, to be used occasionally for flushing purposes. The rain-water overflow and the surface drains in the basement of the house deliver over gullies in connexion with this surface drain.

181. *The Rain-water Drains.*—Before discharging the rain-water into the storage tank it should be passed through a sand and gravel filter that will free it from any gross impurities which may have accumulated during the process of collection. The illustration (Fig. 1) shows a simple form

FIG. 20.



of construction for this purpose. It will be necessary to provide a storm overflow for the ready escape of any large body of water which would be unable to pass through the filter.

182. The plan (Fig. 20) shows a good form of rain-water reservoir, but in the event of another suitable supply being available it would be undesirable to entail the outlay necessary for its construction. In the present case it is given simply as an illustration. The use of the steriliser marked Z on plan No. 8 provides a soft water equal to all requirements and the collection of rain-water is unnecessary. The plan and section (Fig. 20) sufficiently explain the principal details. This reservoir consists of a circular tank built in brickwork in cement supported by buttresses, the bottom of which is kept a few inches above the level of the surrounding area. The tank is covered over on the top, in the centre of which is fixed a ventilated louvre manhole—the whole is lined with Portland cement. Access to the tank is had by means of a short foot-bridge, which also carries the main inlet drain. The whole is surrounded by a light railing.

NOTES ON THE DRAINAGE SYSTEM.

183. *The Levels.*—The first consideration of any system of drainage is one of levels, and where irrigation is to be adopted a fall of a few additional feet will be required. A large house, for instance, like the example given would need a fall of from 25 ft. to 30 ft., and as a rule this class of house is so situated as to admit of such a fall being available. If this is not the case a small cesspool or sump must be formed and the sewage must be raised by an elevator with the best power available. The fall will be divided somewhat as follows:—1. From the house to the cultivating tank, with an allowance for falls in disconnecting chambers, say a 500 ft. run of drain with a minimum fall of 1 in 60 = 10 ft. 6 in., commencing at a depth of 12 in. at the highest point below the ground line. 2. The depth of the cultivating tank and the storage reservoir with the fall for the drain between would amount to 9 ft. 6 in. 3. The land to be irrigated should have a fall, however slight, and the subsoil drains, which will be laid about 2 ft. or 3 ft. below the ground line, must have a slight fall; this may be taken altogether at not less than 5 ft. 4. Beyond this a subsidence pond is desirable from which an overflow passes into a stream or ditch; this may be put at 2 ft. In connexion with this overflow not only must the normal level of the stream be considered, but also its possible rise when in flood. At this point, under some circumstances, it may be desirable to provide a gully fitted with a float-valve to check the back flow. The rain-water from the house and the grounds, it is remembered, is dealt with by a separate system, where a less total fall is required. The total of these falls is made up thus: No. 1, 10 ft. 6 in.; No. 2, 9 ft. 6 in.; No. 3, 5 ft.; and No. 4, 2 ft.; the total fall being 27 ft. In order to economise the fall, most of which is required at the extreme end, it may sometimes be necessary to support the main drain upon a brick wall or embankment, or even upon a stout tressel rustic viaduct, when passing across some depression of the contour line of the ground. Of course, in such cases heavy cast-iron drain-pipes would be used.

184. *The Size of the Drain.*—It is a mistake to use too large a drain; one of 6 in. diameter will generally suffice for the requirements of the largest house, a small drain being more readily kept free from deposit.

185. The following table[3] from some calculations made by Messrs. W. Santo Crimp and A. M. Bruges shows the inclination to be given to circular pipes flowing full or half-full in order to produce a velocity of flow equal to 3 ft. per second, together with the discharge in gallons per minute when flowing half-full.

Diameter of pipe.	Velocity per second.	Inclination.	Discharge (half-full) per minute.
4 in.	3 ft.	1 in 62	49 gallons.
6 in.	3 ft.	1 in 107	110 ,,
9 in.	3 ft.	1 in 183	248 ,,
12 in.	3 ft.	1 in 269	441 ,,
15 in.	3 ft.	1 in 362	690 ,,
18 in.	3 ft.	1 in 462	993 ,,

In providing for the removal of surface water the following tables are generally accepted, but the great variation in the amount of rainfall in different localities renders it impossible to offer any universal rule in this matter.

[3] The Builder, August 6th, 1898.

Quantity of Rainfall per Acre.

Inches.	Cubic feet.	Gallons.	Inches.	Cubic feet.	Gallons.
0·1	365·0	2,262	0·6	2178·0	13,573
0·15	544·5	3,393	0·65	2359·5	14,704
0·2	726·0	4,524	0·7	2541·0	15,836
0·25	907·5	5,656	0·75	2722·5	16,967
0·3	1089·0	6,787	0·8	2904·0	18,098
0·35	1270·5	7,918	0·85	3085·5	19,309
0·4	1452·0	9,049	0·9	3267·0	20,360
0·45	1633·5	10,180	0·95	3448·5	21,491
0·5	1815·0	11,311	1·00	3630·0	22,622
0·55	1996·5	12,442			

Provision for Surface Water at Per Hour.

From roofs	...	...	...	0·5 in.
,, flagged surfaces	...	...	...	0·2 ,,
,, paved ,,	...	...	...	0·1 ,,
,, gravel ,,	clay	subsoil	...	0·05 ,,
,, ,, ,,	gravel	,,	...	0·01 ,,
,, grass ,,	...	...	...	0·02 ,,

186. *The Old Drains.*—All old internal drains must be carefully traced to see whether they lead to any cesspool and must be removed, together with any contaminated earth. Even external drains should be carefully removed, as they may contribute to the pollution of water.

187. *Made Ground.*—In made ground all pipes must be laid upon a 6 in. bed of concrete.

188. *The Drains under Walls.*—All drain pipes passing through walls must be protected by a brick arch or stone lintel, to provide against fracture from settlement in the house.

189. *The Cellars and Areas.*—Cellar or area drains should deliver over an external gully; in fact, open channels should be substituted for drains in cellars. These channels can be readily kept clean, whereas with drains the traps frequently remain for long periods without being re-charged and the result is that the water either evaporates or smells badly. Where these channels are made to deliver over an external gully in connexion with a soil drain the water from a sink or bath should be arranged to deliver over the same gully, so that the water in the trap may be frequently renewed. An iron grate should also be fixed in the aperture through which the channel passes, to exclude vermin. It generally suffices to allow the small quantity of water from this source to soak away into the ground a short distance from the house instead of being connected into the drains.

190. *Ventilation.*—Long lengths of drain should always be ventilated at intervals by 3 ft. open chambers having half channel bottoms with iron gratings at the ground level; in fact, the closer a drain approximates to an open channel the better. This is very important where the drain is small, say 4 in. or 6 in., for should such a drain run full bore when badly ventilated there is great resistance from the compression of the air in front of the flow due to friction and also owing to the vacuum created behind the charge, and there exists a strong tendency to syphonage in the traps. The main 6-in. drain from the disconnecting chamber must be ventilated on the outlet side of the trap by a 6 in. branch pipe carried to some convenient part of the building and continued up above the roof, either in a 4 in. lead 8 lb. soil-pipe or in a 5 in. stout iron galvanised pipe with caulked leaded joints.

191. *Iron Ventilating Pipes.*—The use of iron for ventilating pipes, unless galvanised, is not to be recommended, as drain air rapidly rusts and corrodes them. In the case of a drain- or soil-pipe this action does not take place, the greasy constituents in the sewage forming a protecting coat.

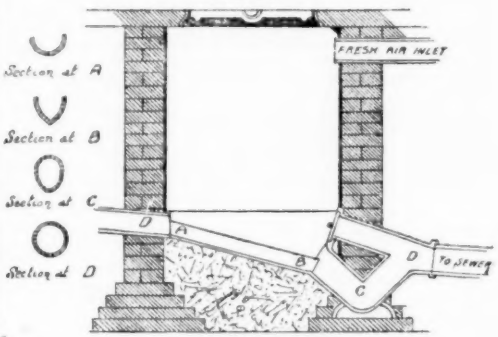
192. *The Surface Water.*—When plans are formed for the treatment of the drainage of a large country mansion an endeavour must be made to reduce as much as possible the quantity of water poured into the soil drain. Apart from the absurdity of needlessly fouling water which has afterwards to be purified the value of the sewage as a manure will be reduced and more land will be required for irrigation. To do this a separate drain must be provided to take the surface drainage from all courtyards, paths, and rain-water overflows round the house and buildings. If possible, avoid crossing these two sets of drains or otherwise bringing them into close proximity, but should it be necessary to cross them the surface water drain must be kept above the soil drain, lest any leakage should occur in the latter at these points and so enter the surface drain.

193. *The Surface Water Pond.*—Where possible this water should be collected in a pond or reservoir (in this case situated in the kitchen garden); the overflow can be carried into the nearest ditch. A brick disconnecting chamber is to be built at the lower end of the pond, in which is fixed the usual trap and channel, and from which a branch-drain is connected into the main drain. A sluice valve or penstock is fitted in the inlet to this chamber. The advantage of this will be fully appreciated not only in the dry season and when it is desirable to give a less concentrated dressing to the land, but also in the winter when the ground is already saturated with moisture. The control of this body of water will also be of advantage for the occasional washing of the storage reservoir of the soil drain.

194. *The Rain-water Drain.*—If the rain-water which falls upon the house is not utilised it must be carried into the surface drain. In any case, even with a cesspool, the surface water must be treated separately. To obviate the necessity of much deep digging it is better to have the highest point of the drain, say, 12 in. below the surface of the ground instead of below the cellar floor. As already mentioned a separate drain should take the waste water from the cellars and areas, carried out in the direction of the slope of the ground and made to deliver over a gully in connexion with the surface water drain or into the nearest natural outlet.

195. *The Soil Drain.*—The soil drain will, of course, be kept entirely outside the house and conducted into a disconnecting chamber (Fig. 21) in the usual way, but in all cases

FIG. 21.



Disconnecting chamber.

at its extreme end an automatic flush tank should be provided to discharge at least 50 gallons of water every twenty-four hours.

196. *The Flushing Tanks.*—The flushing tanks must be proportionate in capacity to the length of the drain which they are intended to flush, as, owing to the friction in the small drains now used, in a long drain the initial force of the discharge is soon reduced, the central body of water rapidly passing away in a gradually attenuated stream, while that portion in contact with the pipe slowly follows.

Note P.—In the example given some difficulties present themselves in providing a flushing tank for each head of the two soil drains, terminating as they do at the principal façades of the mansion. Three alternatives offer:—1. To sink the drain some 4 ft. deep in order to allow of flushing-tanks being built below the ground, in which case they might be charged through a disconnecting cistern fixed in one of the outbuildings. 2. By carrying up drains to the higher ground on the north-east corner and there placing the flushing-tanks. 3. By placing the two flushing tanks in the cistern room and bringing down a 2½ in. discharge-pipe from each to deliver over gullies fixed by wall at the head of each drain marked 10 on plan No. 11, the gullies to have large mouths carried up 2 ft. 6 in. above the ground level, with gratings on top. This plan is shown in the example. The waste from sink J J also discharges into one gully and re-charges the trap, affording an additional protection should the syphon in the cistern fail to act. This precaution, though desirable, is not an absolute necessity.

197. *The Fall of the Main Drain into the Sewage Tank.*—The drain must be laid on a concrete bed at a regular fall throughout. The fall will be regulated by the difference in height between the disconnecting chamber and the sewage tank, which in this case should be capable of holding some 10,000 gallons. If from the nature of the ground it is necessary to make any deviation from a straight line then an inspection chamber must be built at the angle thus made or at any point where a branch drain from the stables or other

buildings may enter it. In Rawlinson's "Suggestions" it states that branch drains should have a fall into the main drain at least equal to the difference in their sectional diameter. No branch drain should be connected at right angles with the main drain but should have an inclination in the direction of the fall, with an inspection chamber or eye at every such junction. Levels must be carefully taken and the trench must be made from end to end before laying the drain, for which purpose the use of sight rails will be found to be very advantageous. The main drain should always be first laid and all branches should have a fall at least equal to that of the main drain, if possible a greater velocity should be given in the case of these drains, as it will tend to accelerate in place of retarding the flow at such junctions.

198. *The Cultivating Tank.*—Just before this main drain enters the cultivating tank (**E** on plan No. 12; also see par. 92) another disconnecting chamber must be built with a syphon next to the tank. The usual iron cover is to be replaced by an iron grating. In addition to this, in some isolated spot a long, narrow chamber, 4 ft. or 5 ft. in length, should be formed in the course of this main drain; the chamber should have a half channel bottom, and the whole be covered with an iron grating. This will completely isolate the house from the cultivating tank. This tank is made with two chambers, each resting alternately. Finally, the effluent passes into a storage or sewage tank **F**, whence it is passed periodically on to the land either by means of a syphon or penstock. With the microbe cultivating tank the clear effluent permits of the use of a very much smaller plot of land than would otherwise be allowable. The River Pollution Commissioners assume a unit of 2000 persons per acre, but this quantity with crude sewage, unless the soil is in every way favourable, must be considered excessive. Where the sewage is in a liquid state from some previous treatment the late Dr. Tidy gave from 5000 to 7000 persons per acre. Where there is plenty of land available it would be wise to disregard any calculation based upon the above figures and to devote at least an acre of land to every 100 of the population with a due allowance for each animal in the farmyard and stables. For the intermittent system the area of land should be divided into a number of compartments, so that the sewage may be allowed to flow on to each part in turn as required. If the land devoted to the purpose is on the side of a hill the catch-work system is well adapted to the purpose, the water flowing over a succession of made terraces. Upon nearly level ground the arrangement shown on the Estate plan No. 12 will be found convenient, but in any case the greatest care must be exercised to ensure that the surface over which the water flows is free from all obstruction and that there are no hollows where the sewage can stagnate and spoil the results by the production of rank vegetation. The first things to be considered are the subsoil drains (see Estate plan No. 12); the depth at which they are laid and their distance apart must depend upon the nature of the soil (see table by Mr. Dempsey).

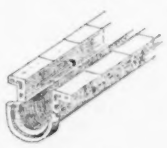
Drainage of Land.

Character of soil.	Distance of drains apart.	Depth of drains.
Heavy soils.	ft.	ft. in.
Compact, tenacious, gravelly clay ...	15	2 6
Stiff adhesive clay	16½	2 6
Friable clay	18	2 9
Free soft clay	21	2 9
Medium soils.		
Clayey loam	22	3 0
Marly loam	24	3 0
Gravelly loam	27	3 3
Friable loam	30	3 3
Light soils.		
Light gravelly loam	33	3 6
Light marly loam	36	3 9
Light sandy loam	39	4 0
Soft light loam	42	4 0
Sandy soil loam	45	4 0
Light gravelly sand	49½	4 3
Deep gravelly sand...	55	4 3
Coarse gravelly sand	60	4 6
Loose gravelly sand	66	4 6

An average depth is about 3 ft. 6 in. with a distance apart of some 30 ft., and the number of 12 in. agricultural drain-pipes required varies from about 3000 to the acre in the heaviest soils to about 650 in the lighest. The main outlet should be conducted into a reservoir (marked **H** on plan No. 12) in which the effluent water is allowed to subside before it overflows into the stream which is to receive it. This water, if the irrigation is properly conducted, will be (if not immediately suitable for drinking) very far advanced towards a state of purity.

The amount of liquid sewage finally collected is calculated at about 1500 gallons per day, being the maximum probable amount. Now each dressing to the land should not be less than about 1 in. over the whole surface, and this would be equal to 22,622 gallons per acre. The plot of about 2½ acres on the plan is divided into eleven parts of ¼ acre each. It will therefore be necessary to collect 6750 gallons, or nearly five days' supply, of sewage effluent in the tank **F** in order to flood one plot. This will allow an interval of a little less than three weeks before it will be necessary to administer a second dressing to any one plot. This again will depend upon the number of people in occupation; as a rule the late autumn and winter months are those in which these houses are most fully occupied. These being the months during which the ground is most saturated it may be desirable that the amount of land devoted to irrigation should exceed the limit just proposed. Of course, the nature of the crop grown on the several plots will determine the question as to how frequently the dressing should be repeated. There is a 5 in. cast iron pipe carried from the bottom of the storage tank as far as **G**, where it is fitted with a "Handy-straightway valve." The plots are divided by the main carriers, which are better if fitted with half-round, glazed channel bottoms about 9 in. wide (Fig. 22). The sides also may, if preferred, be lined with glazed earthenware bricks especially made for the purpose. Sluice valves must be fixed at various points in order to divert the stream over each plot as desired, or this may be done by simply cutting off the channel by means of a piece of stout sheet iron driven into the earth across the main carriers if these are not lined. There are numberless ways in which irrigation can be applied, and the methods will vary according to the situation of the land to be devoted to the purpose. Its ready application will frequently tax the ingenuity of the individual adapter, but enough has been said to show that it is a matter of great simplicity and undoubtedly the only way in which all sewage should be disposed of where the water carriage system is adopted. With an institution holding a constant resident number of inmates there is less difficulty in regulating the several factors tending to a satisfactory result. It is difficult owing to the limited space at disposal to go fully into the varying possibilities of every case, but no insuperable difficulty will be experienced if the following points are kept in mind: (1) the nature and permeability of the soil, regulating the depth of the subsoil drains; (2) the crops intended to be grown; and (3) the possible amount of sewage and if it is likely to vary to any great extent, together with the probable season of such variation.

FIG. 22.



Main carrier.

199. *Drains Under Roads.*—Should any drain be laid along or cross under a road precautionary measures must be taken to protect it from damage by heavy traffic.

200. *Disconnected Pipes.*—All sink and other waste pipes should deliver over half-channel pipes before running into gullies.

TREATMENT OF BUILDINGS THAT ENVIRON THE MANSION.

201. *The Lodges.*—Each cottage or lodge to be connected with the system must be treated as a detached house and have a separate disconnecting chamber. The bailiff's house and the lower lodge, being situated in depressions below the level of the drain outfall, will be treated differently.

THE LAUNDRY.

202. The drying yard should be turfed throughout and the gullies in the several paths should be connected into the surface drain, for the smaller the area

of ground which is paved the fewer are the opportunities for accumulations of offensive matter. Any foul water falling upon the living earth such as grass land is at once purified, but the same falling upon a paved surface escapes through fissures, under more or less pressure, to the earth below and has to depend entirely upon mechanical action to restore its purity. There need be no drains within the laundry but channels should be provided in order that the floor may be kept thoroughly dry. Square fireclay tubs are considered to be the most satisfactory in every way, but as they absorb a large amount of heat from the water in the first instance there must be a very efficient supply of hot water. External gullies must be provided to take the wastes from these tubs, the drain from which discharges into a disconnecting chamber. A closet is to be formed and fitted in this laundry in all respects the same as closet **EE** in the mansion but with a white glazed trap, and a separate drain from this closet is connected into chamber having a 3½ in. 10 lb. lead ventilating pipe carried up above the highest point of the roof and clear of all windows. The laundry is divided from the stables by a 14 in. brick wall which runs longitudinally through the building, the rooms on the first-floor being used for drying and ironing. The rain-water falling on these buildings, which cover a considerable area, is collected in the main rain-water tank after passing through a filter. (See Fig. 1.) Provide and fix a 300-gallon galvanised iron cistern in the first floor with overflow through external wall, carry down a ¾ in. warning-pipe to pump.

Note Q.—In cisterns charged by pumps a "warning-pipe" is commonly fixed. It consists of a small pipe connected into the cistern just below the level to which the cistern is to be filled, the other end of the pipe terminating close to the operator at the pump. The operator watches the end of the pipe and the first sign of water escaping warns him to desist from pumping.

Provide and carry to this cistern a 1½ in. galvanised iron rising main from pump. Soft water acts very readily upon lead and iron pipes, so that either galvanised iron or copper tubes must be used for the hot-water circulation to the tubs, copper being the best, as there is always a certain amount of risk of iron-mould to the clothes where iron is used for hot water, even if it is galvanised. (See pars. 10 and 44.)

A copper dome-top boiler is to be set in brickwork with 1 in. copper flow and return pipes carried round the walls of the laundry to a small copper supply cistern which is fixed at the extreme end of the circulation. From the flow-pipe short supply-pipes are brought down to the tubs, these pipes being fitted with horizontal bib-valves. Provide and fix a dead-weight safety-valve to the boiler. Lay on a ¾ in. block-tin or copper pipe for supply to feed the cistern from the cold soft-water cistern. Carry a similar cold 1 in. service-pipe from the same cistern to supply each of the tubs. Carry to this soft-water cistern a ¾ in. lead supply-pipe from the main in the road fitted with a ¾ in. high-pressure ball-valve and screw-down stopcock as a supplemental supply. In addition to the above a ¾ in. short branch pipe is brought off the main and is carried to one of the tubs, being fitted with a screw-down bibcock and having a ¾-in. screw-down stopcock fixed in the service-pipe just above the draw off.

THE STABLES.

203. The stables should be drained with cast-iron channels and covers made to deliver into the open air over a gully. The drains from the water-closets, sinks, gully, &c., will be made to meet in a disconnecting chamber and will be ventilated in the usual way, together with the upper end of the main branch from the sewage tank.

GARDENER'S LODGE No. 5.

204. *Recommendations with regard to the Gardener's Lodge, No. 5.*—The existing open midden in the garden is to be cleared away and filled in with dry ground. Build upon a proper footing in 9 in. brickwork a lean-to building to form a new water-closet, 4 ft. 6 in. by 3 ft., the inside measurement being at the lowest point 7 ft. 6 in. high. Provide a window in the end, fitted with a casement sash measuring 3 ft. by 2 ft. glazed with obscured glass. Provide a ledge door and frame, 6 ft. 6 in. by 2 ft. 6 in., with an oak sill. Form a lean-to roof covered with slates. Form a Portland cement floor laid on a 3 in. concrete bottom. Provide and fix a short flushing rim hopper closet and carry a 4 in. stoneware pipe drain into the disconnecting chamber. Supply and fix a properly hung deal seat. Twice limewhite the closet walls. Supply and fix upon suitable brackets a 3-gallon galvanised iron flushing tank and lay on a ½ in. stout lead branch service-pipe from the slate cistern in the scullery, this being fitted with a ½ in. ball-valve. Continue the short overflow-pipe through the external wall. Lay on a supply to the arm of the closet with a 1½ in. lead service-pipe, properly fixed with cast-lead tacks, from the flushing cistern.

205. *Sink and Supply to same.*—There is a stone sink in the scullery with a brick drain under it leading into the ditch on the other side of the road. A slate cistern (100 gallons) is fixed in the scullery to supply this sink. There is no overflow-pipe, but a warning-pipe (see Note Q.) is carried to a pump fixed over a deep well. This pump is worked by horse power and supplies water for the gardens and farm buildings, being taken to the two last in a water-cart.

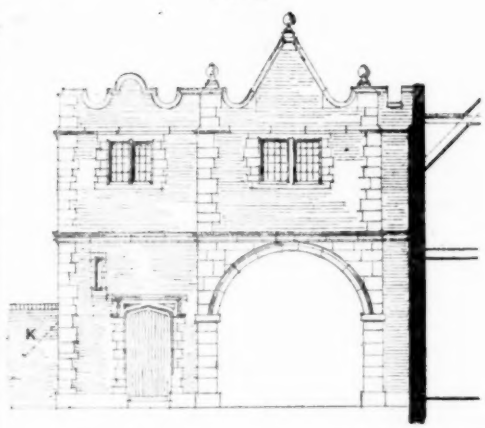
206. *Recommendations.*—Replace the old stone sink by one of glazed stoneware. Provide and fix a 1¼ in. lead syphon trap under it (see Fig. 18) and carry the waste-pipe through the external wall to deliver over a new gully. Disconnect the present supply from the pump and connect into the nearest point of the new main in road a ¾ in. stout galvanised iron service-pipe fitted with a ¾ in. equilibrium ball-valve. Remove the warning pipe and instead carry a 1¼ in. overflow-pipe through the external wall.

THE BAILIFF'S HOUSE.

207. The bailiff's house (No. 6 on plan No. 12) is of much earlier date than the mansion, and is situated in a hollow; the whole of the drainage will have to be dealt with locally; the system adopted will be that recommended by Dr. Poore, which can here be well exemplified.

208. *The Present Arrangements of the Bailiff's House.*—The water-supply is from a well about 60 ft. deep, which is fitted with a windlass and buckets. There are two midden-closets in the garden which are built over a ditch which is dry excepting in times of heavy rain. The sink in the scullery has a short lead waste-pipe connecting into a brick drain, which is carried into a cesspool in the garden. A pan closet on the first-floor landing is connected into cesspool by a 4 in. iron rain-water pipe. The cistern over closet is charged by rain-water from valley gutter of roof with a 3 in. zinc standing waste carried into side of D-trap of closet. There is a supplemental supply to charge this cistern from the pump in scullery. There is a short system of brick drains under the kitchen wing which take water from the brick floors and yard gullies, eventually delivering into the ditch. There is thus an easy communication for rats to the interior of the house.

FIG. 23.

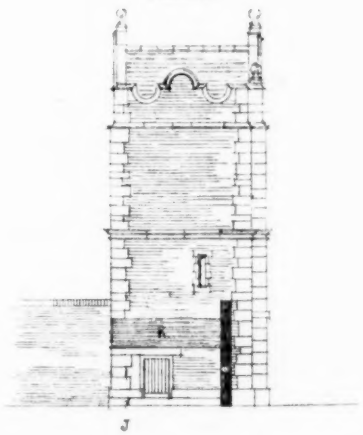


Front Elevation.

209. *Recommendations.*—The water-closets, bath waste water, and bedroom slops are treated separately, as also is the waste water from the sinks. The present closet in the house, which is connected into the cesspool in the

garden, is to be entirely removed and the walls of the cesspool are to be broken down, the whole being cleared away and the opening filled in with earth. A small annexe is to be built, as shown (Figs. 23 and 24), connected with the main building by a short corridor provided with cross ventilation. The upper portion (Fig. 25) consists of a bathroom and closet with sink, whilst below (Fig. 26) is another

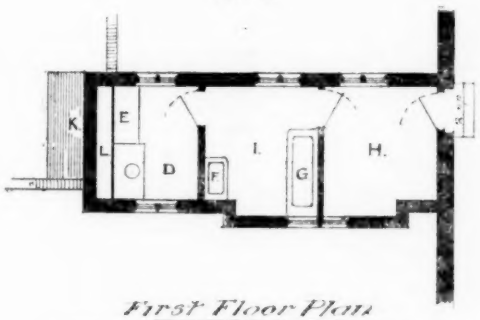
FIG. 24.



Side Elevation.

closet for the use of the domestics, access being had to the same through the arch supporting the corridor which thoroughfare is thus protected from wet. The illustrations, which are adapted from those in Dr. Poore's book upon Rural Hygiene, will clearly indicate the details. The points to be particularly noticed are the cross ventilation of the lobby to the closet and also of the capacious dry catch; the ventilation of this last is effected by the iron gratings in the wall and by the brick flue at the back of closet (see Fig. 9). The seat of the closet is only 14 in. above the floor line in place of the usual 18 in. This is a

FIG. 25.



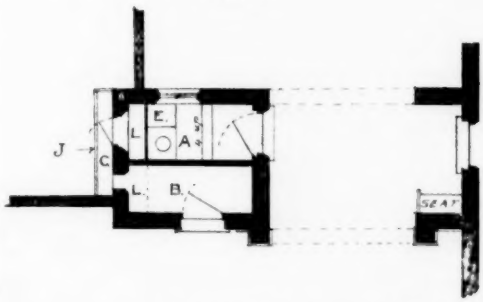
First Floor Plan.

D, Closet. E, Earth box. F, Sink. G, Bath. H, Lobby with cross ventilation. I, Bathroom. K, Lean-to roof to exclude rain from C. L, Ventilating shaft open at roof.

very important point, as when the closet is used the dejecta fall perpendicularly instead of being thrown against the pan. There are also certain physiological advantages from the position assumed by the user of the lower seat which are absent in the other.

The pan, which may be constructed either of earthenware or metal, is provided with a straight back and is fitted with a flap-valve which is so adjusted by a counterbalance weight that it permits the excreta and earth to fall at once into the catch below, at the same time excluding any up draught (see Fig. 27). The floor of the catch is cemented and the door to it has a space at the bottom of some 4 in., which is filled with fine wire netting, so that air may freely enter and all small animals may be excluded. One or two shovelfuls of dry "living" earth taken from the surface of the ground are thrown on the floor after each removal of the contents of the catch. (Earth taken from below the surface is dead and exerts no humifying influence.)

FIG. 26.

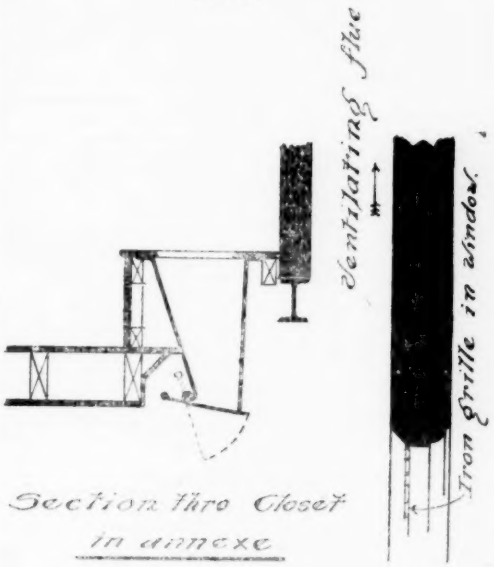


Ground Floor Plan.

A, Closet for domestics. B, Dry catch of upper closet. C, Gutter for urine. E, Earth-box. J, Dwarf wall round C to exclude surface water. L, Ventilating shaft open at roof, sides, and end provided with air spaces.

The dry catch has many advantages over the pail system. In the first place, if from any cause the closet should not receive the usual daily attention no evil will result even though it be left for a week, whereas with the pail not only does it become full, but owing to urine being unable to escape and evaporate, it soon becomes offensive. The condition into

FIG. 27.



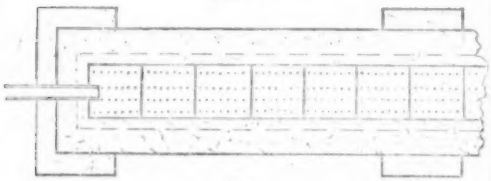
Section thro Closet in annexe see Fig 25.

which these pails have been permitted to fall owing to neglect has in a large measure brought the earth-closet into such bad odour. The large pails used in some places where the so-called dry system is in vogue are at the end of the week in a condition to poison anyone who is unfortunate

enough to come within a yard of one of them. Where the closets are used extensively for micturition a trough must be formed, as shown in Fig. 26, into which the urine will drain. This trough must be filled with sawdust or earth and will only require to be emptied at intervals, varying, of course, with the number using the closet. It is important that rain-water should be excluded. The other midden closets in the garden are to be converted into dry-catch closets.

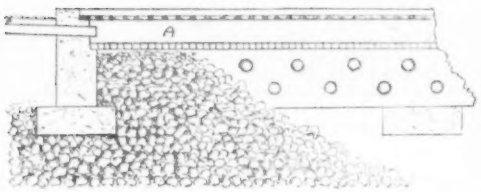
210. *The Bath.*—A short 2 in. lead waste-pipe is to be carried through the external wall, properly trapped and ventilated by a 1½ in. anti-syphonage pipe carried through external wall (see Fig. 18), to deliver over a 2 in. galvanised cast-iron rain-water head the pipe from which is carried on across the arch and down to deliver into a half-round channel gutter which crosses the stable-yard and empties over an evaporating trench or filtration gutter to be described (see Figs. 28, 29, and 30). Dr. Poore objects

FIG. 28.



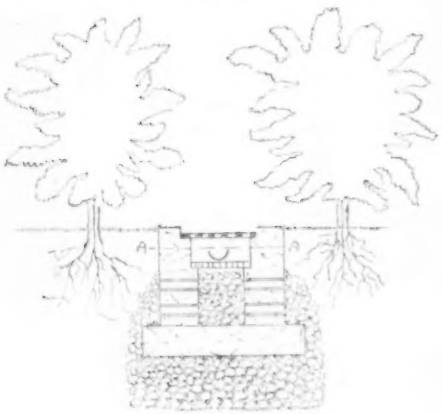
Plan.

FIG. 29.



Longitudinal Section.

FIG. 30.

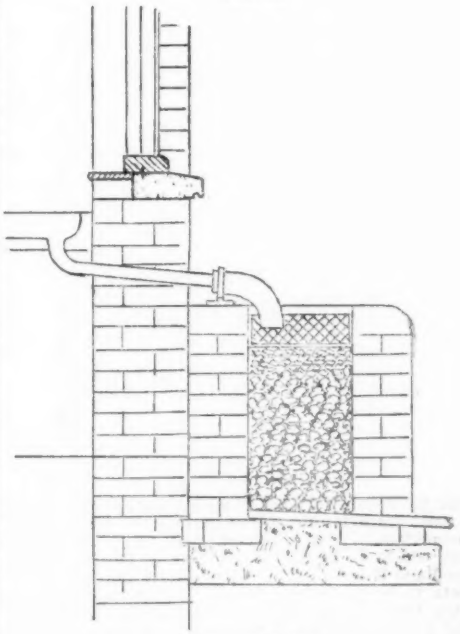


Transverse Section.

to the use of any trap under either a bath or sink as forming a receptacle for the development of putrefactive organisms, but it is doubtful if the absence of this trap compensates for the foul air that is then frequently drawn into a room through the waste-pipe in which the fatty matter from the soap accumulates and decomposes, though by keeping this pipe thoroughly ventilated much of this is avoided.

211. *The Filtration Gutter.*—To receive the slop waste water a trench should be formed on the other side of the stable-yard 15 ft. long, 2 ft. 6 in. wide and 2 ft. deep, the sides being lined with 9 in. dry brickwork or formed in concrete pierced with 2 in. agricultural pipes. This trench is filled to a height of some 12 in. with small stones, which offer a large evaporating surface. The stones may be covered with perforated tiles which permit some of

FIG. 31.

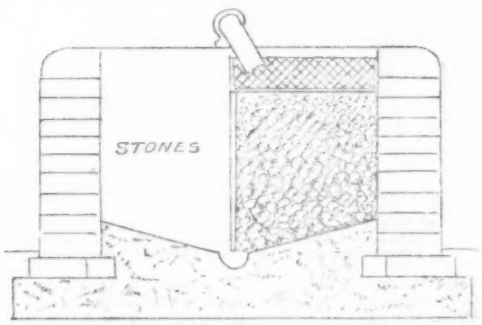


Transverse Section.

the water discharged upon the surface to flow on and gradually become absorbed. A hedge is planted on either side of the trench which also helps to absorb and evaporate the moisture. If desired the trench may be covered by an open iron grating.

212. *A Slop Sink* properly trapped and fitted with anti-syphonage pipe is to be provided on the first-floor for the reception of the bedroom slops. The waste-pipe from this

FIG. 32.



Longitudinal Section.

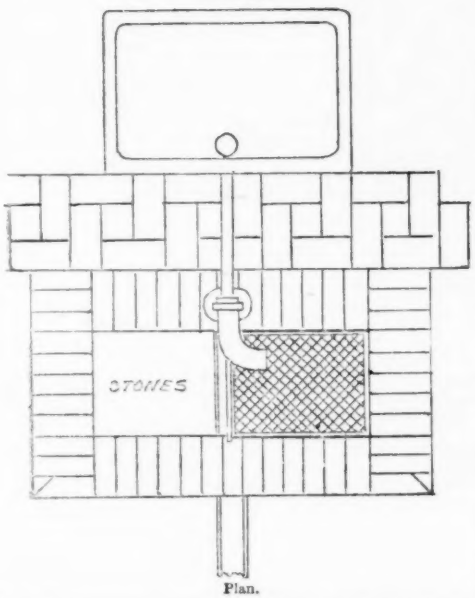
sink delivers over an open half-round channel which ultimately connects into the evaporating trench. It is of course unnecessary to insist that the joints of these channels should be watertight excepting those immediately surrounding the house.

213. *The Scullery Sink* is treated somewhat differently. In order to keep the discharge from the waste-pipe above the ground level it may be necessary to form a raised platform by means of which the sink may be kept up an additional 14 in. or 15 in. (Fig. 31). The waste-pipe from this sink discharges over a brick-built chamber filled with small stones. This chamber measures about 3 ft. 3 in. by 1 ft. 3 in. by 2 ft. deep and is divided in the centre by a 1 in. slate division; the bottom and the sides of the two compartments thus formed are rendered in Portland cement. There is an outlet from each of these compartments into an open channel which is connected with the main system (Fig. 32). The actual waste-pipe from the sink is fitted with a swing nozzle which permits the discharge to be directed into each of the divisions of the chamber every alternate week, the water from the sink passing first through a wire straining dish, which arrests tea-leaves, potato-peelings, or any other solid refuse which it is necessary to exclude (Fig. 33). The stones in the compartment at rest have to be lifted out and exposed to the air and sun about once a month for one or two days, but they do not require any other attention. This system of dealing with a scullery sink waste water has been found to answer admirably in a small establishment but its suitability for a large house or hotel discharging daily large quantities of fat and sand would be open to question unless provision were made to arrest the deposit. It is unnecessary to detail the plumber's work in connexion with the water-supply which is brought from the main supply to the hydrant situated at the corner of the farm buildings.

FARM BUILDINGS.

214. The farmyard, or more correctly the stockyard, presents some difficulty to the sanitarian in order to comply with the accepted practice and the requirements of the agriculturist. It is desired

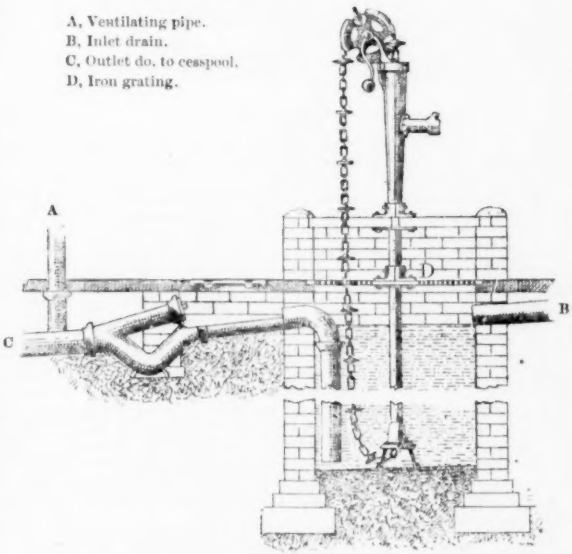
FIG. 33.



Plan.

that the manure may be trodden by the stock into the straw laid down and the whole mass be intimately mixed. This produces a form of manure the effect of which when it is spread upon the land is more readily apparent than is the case where it is used prior to its assuming this rotten condition. It is, however, open to question whether the land receives the permanent benefit that would accrue to it if this manure was placed on it in a less advanced stage of decomposition. That the air

FIG. 34.



Manure tank.

emanating from these festering heaps is detrimental to the health of the cattle which winter on them cannot be questioned. The ground beneath is sodden with moisture and has no period of rest in which aeration might restore it to a condition capable of assisting nitrification, one result being that a large quantity of valuable liquid manure is not only lost but leaks away through the lower stratum of the soil with the chance of polluting any adjacent wells or streams to which it must eventually gain access.

Milch-cows may often be seen standing knee-deep in this liquid mess with their udders fouled by the filth, a condition of things by no means pleasant to contemplate. The floor of the farmyard, piggeries, and cow-stalls should be formed of some impervious material, such as brick, asphalt, or concrete and cement. Channels must be made to conduct the surface drainage into a manure tank (see Fig. 34) in the yard. This tank must not be of a large size, but should hold about 500 gallons and should be fitted with a chain pump so that the contents can be occasionally discharged over the manure in the yard to increase its value or into a cart for use elsewhere. This tank must have the sides carried up above the level of the surrounding straw and must be covered by an open iron grate. A 6 in. overflow-pipe like an inverted syphon from the bottom of this tank is to be carried into the main drain, with a syphon trap fixed close to the manure tank, as illustrated, and a 5 in. galvanised iron ventilating-pipe is to be carried up from the end of the drain as before described. The animals must, of course, be provided with open sheds in which to obtain shelter, but the practice of roofing over the whole of the stockyard in order to exclude rain is not much to be commended as it is apt to confine the emanations from the manure, nor is it necessary where the yard has an impervious bottom and is properly drained. The straw-yard cannot be looked upon with favour from a sanitary point of view. Dr. Poore, in his book upon Rural Hygiene, says that the farmer who buries his organic manure *directly it is produced* will lose nothing by waste. It will not give off ammonia to the air nor will the juices be washed away by rain to the same extent as when it is left above ground to be a nuisance. There seems to be no doubt whatever that all heaps of manurial matter which give off ammonia and other gases to poison the air and perhaps do more serious mischief are allowing valuable matter to escape

which ought to be undergoing oxidation in the earth. In fact, for the agriculturist stink means waste. The reasons why farmers allow putrescible matter to fester in heaps appear to be (1) that it has to be kept till the land is clear and circumstances permit of its being dragged to the fields; and (2) that when the matter is thoroughly rotten and most offensive *a more rapid and visible* result is produced, notwithstanding that the total result is probably less than if it had been applied to the ground at once. It is certain that putrescible matter intended for manure must waste more above ground than when buried immediately beneath it.

THE LOWER LODGE NO. 8.

215. The lower lodge No. 8 presents a striking example of the evils of cesspool drainage owing to the water-logged condition of the ground.

216. *Closet.*—There is a water-closet in the back addition which drains into a cemented cesspool, also receiving the waste water from the scullery sink and the rain-water from the roof. The cistern supplying the water-closet is fixed in the scullery, the sink in which is also supplied from the same source. This cistern is filled by means of a pump in the scullery which draws its supply from the shallow well in the garden. The pump is defective and the barrel is too large for the existing suction pipe.

217. *Recommendations.*—The closet, the cistern, and the pump will be entirely removed together with the stone sink. The closet, which is a small lean-to building next to the scullery, will be cemented throughout, including the floor, with Portland cement after the removal of the seat and the present wood floor, and a door fitted in the back wall of the closet under the new seat, which last is raised upon two brick steps and the whole finished as described for the servants' closet **AA** and **BB** (par. 144), with the exception of lining walls with tiles.

218. *Cesspool.*—No provision is made for any overflow from this cesspool as there is no place other than the stream into which such an overflow could be carried. The result of this is that the liquid contents escape into the surrounding ground, which is already saturated with moisture. During heavy storms the evil is, of course, more pronounced, the contents of the cesspool overflowing at the top on to the surface. Were it not that the well is favourably situated above instead of below the cesspool—that is, in the opposite direction to the flow of the subsoil water—very serious pollution must have ensued (see par. 31, Fig. 2).

219. *Recommendations.*—The contents of the cesspool must be entirely removed and the brickwork broken up and carted away, the hole being filled in with fresh earth.

220. *The Well.*—Owing to the isolated position of this lodge the water-supply will be taken from a shallow well about 12 ft. deep already existing, but it must be lined with tubes, as described in par. 33, the upper one standing up 18 in. above the ground level. The bottom of this well is to have a 12 in. layer of clean flints or rough stones; on the top of these stones about 6 in. of coarse gravel are placed, then come another 6 in. of fine gravel and 2 ft. of well-washed sharp sand, and, lastly, a few inches of fine gravel are laid to prevent any displacement of the sand by the action of the pump. The normal level of the subsoil water at this point being not more than about 3 ft. below the surface there will always be about 5 ft. of water in the well. Carry upon 4 in. of Portland cement concrete round the outside of the upper tube forming the well 9 in. of brickwork in cement, finished with a course of brick on the edge. Provide a circular wood cover to the top of the well, fitted with iron handles for lifting, and covered with 5 lb. sheet lead dressed down 3 in. all round the rim. The under side of the cover touching the top of the inner well tube is to be packed with a layer of asbestos sheeting so that it may fit closely and prevent the entrance of insects to the well. As the lodge occupies slightly rising ground on the north side of the valley which is drained by the stream and the lake and towards which the subsoil water flows, there is no danger of pollution to the shallow well, the soakage being away from it, whilst the depth of the well will not permit the water to be lowered so as to influence the drainage area in the neighbourhood of the soakage trench.

221. *Pump.*—Provide and fix in the scullery a 2½ in. barrel pump, carry a 2 in. stout lead suction-pipe from the same to the bottom of the new well, this pipe being laid in an open-jointed, tile-covered brick channel. This suction-pipe, just where it enters the well, is to be fitted with a lead collar so as to throw off any water that may have run back on the outside of the pipe. Care must be taken that the hole through which it enters the well is made quite sound so as to exclude any surface water.

222. *Sink.*—Provide and fix in the scullery an earthenware enamelled sink 2 ft. 6 in. by 1 ft. 8 in. with a 1¼ in. lead trap under the same. Carry the 1¼ in. lead waste-pipe through the external wall so as to deliver into an open channel-drain and provide the usual 1¼ in. anti-syphonage pipe.

223. *Slop sink.*—In the external corner by the scullery door form on a concrete bed an enclosure constructed with blue Staffordshire bricks laid in cement, measuring 18 in. by 18 in. and 12 in. high, built in 4½ in. work and finished with half-round bricks on edge on the top, with the interior sloping into a half-channel bottom. Continue this channel to connect with that from the sink. This enclosure is to form a receptacle for the bedroom slops, which must not be thrown into the scullery sink. If the rain-water is not to be utilised the rain-water pipes can deliver into open channels connected with those already mentioned. The outlets from these channels are to be carried in a direction opposite to the well and are to be turned into a filtration gutter some 10 ft. long (see par. 211). By the side of which gutter a hedge is to be planted which will be found to assist evaporation greatly.

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